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Wheat Breeding Bibliography, Part I	...	1	6	Bibliography on Interspecific and Inter-	
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Lodging in Cereals	...		6		2

Plant Breeding Abstracts

Vol. III, No. 3.

Part I. British Empire

GENETICS 575

290. HARLAND, S. C. 575(063)
The Sixth International Congress of Genetics. 633.51:575.243
Emp. Cott. Grow. Rev. 1933: 10: 17-20.

A brief account of the Congress, special emphasis being laid on the living chromosome map of maize, plants carrying the appropriate genes being set at corresponding distances apart, the artificially induced polyploids in maize and the occurrence and inheritance of various mutant forms in cotton produced by X-rays. Some of the latter are in the direction of increased leaf surface and are hence referred to as "progressive."

291. NEETHLING, J. H. 575.1
Development in plant genetics.
Fmg. S. Afr. 1932: 6: 485-86.

A brief popular outline of the development of Mendelism and the various associated theories, with indications of the great practical benefits accruing from the application of the science to plant breeding.

AGRICULTURE 63

292. STOCKDALE, F. A. 63(72.9 + 72.99 + 88 + 72.82)
Report by Mr. F. A. Stockdale on his visit to the West Indies, Bermuda,
British Guiana and British Honduras, 1932.
Colon. Adv. Coun. Agric. Animal Health 1932: 128: Pp. 102.

The report includes a brief but comprehensive survey of the conditions of crop cultivation in the West Indian area, the problems involved and the progress made. Mention is only made in this summary of the plant breeding work.

TRINIDAD.

Research in cacao, the principal crop, includes selection for increased yield. Varieties resistant to witchbroom disease are needed. The work of the Imperial College of Tropical Agriculture is described. Of particular interest is the work on banana breeding in progress in the Botany Department and the investigation on cacao in connection with the recently inaugurated Cacao Research Scheme.

BRITISH GUIANA.

Breeding work with sugar cane. Large numbers of seedlings and hybrids are being tested. Varietal resistance to moth borer has been found. Pure line selection work with rice is being carried on.

DOMINICA.

Varieties of limes are being tested for resistance to withertip disease and crosses have been made between the resistant varieties and the West Indian lime and some promising hybrids have been secured.

JAMAICA.

Because of the increasing incidence of the Panama disease it is necessary to grow only immune varieties. In order to combine immunity with other characters of economic value various crosses have been made and some hybrids of Gros Michel with other varieties are promising. Sugar constitutes the next most important crop in the island and a number of seedling canes are being tested. Varieties resistant to mosaic are of the most importance.

BARBADOS.

Breeding work with sugar cane is in progress. Satisfactory hybrids have been raised between Barbados and Java varieties but further improvement is needed.

FIELD TESTS 631.421

293. EDEN, T. and YATES, F. 631.421:519.24
On the validity of Fisher's z test when applied to an actual example of non-normal data.
 J. Agric. Sci. 1933: 23: 6-17.

A skew distribution obtained from the observation of 256 height measurements on wheat was made the basis of this study. The data were arranged as a potential lay-out for a 32 plot trial, and 1000 random samples from this distribution were treated as plot trials with four hypothetical treatments. The methods of the Analysis of Variance yielded for each a value of z , and the resulting distribution of z -values was compared with the known theoretical distribution on the basis of a normal population. The agreement was exceedingly good, and the authors concluded that the z -test may safely be applied to data of this type.

294. YATES, F. 631.421:519.24
The principles of orthogonality and confounding in replicated experiments.
 J. Agric. Sci. 1933: 23: 108-45.

This is an important contribution to the theory of field experimentation. It is shown how the simplicity in the treatment of the simpler forms of lay-out, e.g., randomized blocks and the latin square, is due to the fact that the arrangement is orthogonal. Briefly this means, for example, that blocks are equalized in respect of treatments, and treatments are equalized in respect of blocks. The efficiency of an experiment may be seriously lowered through lack of orthogonality, but in certain cases this is unavoidable, as when plot values are missing at harvest. This may be allowed for by mathematical methods. In other cases non-orthogonality may be deliberately introduced in order that a limited number of plots may give more information than would be possible if orthogonality were maintained. This has, for example, been the practice at Rothamsted, and it has often been successful, but here for the first time the full mathematical implications of the theory have been gone into. A full solution is seen to involve very complex algebraic manipulation, such as few field workers will be prepared for, and examples are worked out in particular cases.

295. CHESMAN, E. E. and POUND, F. J. 631.421:633.74
Uniformity trials on cacao.
 Trop. Agriculture 1932: 9: 277-88.

Individual yield figures of cacao from a large number of trees had been collected by the Trinidad Department of Agriculture over a period of many years. These have been studied statistically to obtain information on the degree of variability in plantation cacao, and hence on the minimum size of plot to adopt for field experimental work with this crop. The method of analysis of variance was used, and what is of particular interest is the way in which the results of previous years may be used to gain precision in the comparisons of the year under review. The authors find that with reasonably homogeneous cacao a latin square lay-out with 12 to 18 trees per plot may be expected to demonstrate differences of the order of 30%, while the use of two or three years' previous records may double the precision. Field experiments cannot be recommended for cacao heterogeneous for age unless previous records of natural yield are available; if they are, then under favourable circumstances experiments will be practicable, though not so satisfactory as with cacao uniform in age. Considerable seasonal variation is shown to exist.

FUNGI 632.4

296. JOHNSON, T., NEWTON, M. and BROWN, A. M. 632.452:575.12:576.16
Hybridization of *Puccinia graminis tritici* with *Puccinia graminis secalis* and *Puccinia graminis agrostidis*.
 Sci. Agric. 1932: 13: 141-53.

Crosses were made between two physiological forms of *Puccinia graminis tritici* and *P. graminis secalis*. Hybridization was easily accomplished and four physiological forms 70, 104, 111, and 112 were identified whose pathogenic reactions proved their hybrid nature. Hybridization between *P. graminis tritici* and *P. graminis agrostidis* was only successful in one case and the hybrid so obtained resembled form 111 in pathogenic properties.

297. CRAIGIE, J. H. 632.452:575.12:581.162.4
Union of pycniospores and haploid hyphae in *Puccinia helianthi* Schw.
 Nature 1933 : 131 : p. 25.

Several pycniospores have been observed in union with the hyphae protruding from haploid pustules in which the nectar has been intermixed. The nucleus of the pycniospore appeared to have evacuated, passing into the mycelium through the protruding hypha.

298. FRASER, W. P. and LEDINGHAM, G. A. 632.452P:coronata:576.16
Studies of the crown rust, *Puccinia coronata* Corda.
 Sci. Agric. 1933 : 13 : 313-23.

The alternate hosts and the biologic specialization of the crown rust were studied in the Prairie Provinces of Canada.

Aecia were obtained from 4 aecial hosts and inoculated on to a number of grasses in the greenhouse. Uredospores were also used in these inoculations. The results of experiments indicate the existence of 4 varieties of *Puccinia coronata* in the district.

Comparative measurements of the aecial cups, urediniospores, aeciospores and teliospores suggest certain relationships between the *Puccinia* varieties above.

The reaction of various hosts is indicated.

299. BROWN, A. M. 632.452:576.356.5:633.854.78
Diploidisation of haploid by diploid mycelium of *Puccinia helianthii* Schw.
 Nature 1932 : : 130 p. 777.

Sporidia of *P. helianthii* were sown on the upper surface of sunflower seedlings ; this gave rise to haploid pustules which bore no aecidia. Later on urediniospores of *P. helianthii* were sown beside these pustules ; this produced uredinia, i.e. diploid pustules, so that diploid mycelia began to develop in juxtaposition to haploid. Some days afterwards aecia appeared on the under side of the haploid pustules. These results make evident the diploidization by successive nuclear divisions of a haploid mycelium brought into contact with a diploid mycelium.

ECONOMIC PLANTS 633

300. HENNING, P. D. 633.1:575(68)
Winter cereal research at Langgewens.
 Fmg. S. Afr. 1932 : 7 : 400-01.

Includes variety tests of a number of the new winter cereals produced by the Department of Genetics, of the University of Stellenbosch. Some of these new strains were markedly superior to the standard types.

301. DICKSON, J. G. 633.1-2.4-1.521.6:575
Studying the effect of environment upon the development of parasitic diseases and selecting for disease resistance presents problems in co-operation in research.
 Sci. Agric. 1932 : 13 : 213-24.

The prejudice to biological research in the past from undue specialization of the sciences is emphasized. The author goes on to discuss a number of points which it is important to take into consideration in growing experimental plants, together with a number of suggestions for obtaining the required experimental conditions in the most efficient way.

Examples of how co-operation between different departments has enabled problems to be solved are given with reference to *Gibberella saubinetii*, which attacks wheat only at high and maize only at low temperatures. These phenomena have a metabolic basis and an understanding of them has led to the production of resistant strains of both plants.

Stress is laid on the impossibility of solving problems of this complicated nature without viewing them from various standpoints, which can only be done by the co-operation of specialists in different fields.

302. NEETHLING, J. H. 633.11:575(68)
All our own wheat. Factors in the Union's enhanced production of the bread crop.
 Fmr's. Wkly. 1932 : 43 : 831-33.

In the section on selection of varieties it is shown how the creation of improved varieties and the consequent reduction in the number of different varieties grown, together with the greater knowledge of the properties and requirements of each have put wheat production on a much more economic basis.

303. GORDON, G. S. 633.11:575(94.5)
Wheat breeding. The production of improved varieties.
 J. Agric. Vict. 1932 : 30 : 512-14.

Since 1908 the Department of Agriculture, Victoria has been engaged in the task of breeding improved varieties of wheat. Of the 16 most promising and popular wheats of 1909, only two, Federation and Yandilla King are now grown to any extent. There has been a gradual replacement of the older types by varieties which yield at least two bushels per acre more and which combine qualities of value to the farmer, the miller and the baker. Among the varieties grown at the State Research Farm, Ramee, Rajah, Free Gallipoli, Sepoy and Ghurka have already been distributed and several promising hybrids are still being tested.

304. SIGFUSSEN, S. J. 633.11:581.46:575.061.5
 633.11:581.46:575.061.6
Smooth-awned wheat : inheritance of barbing and awn colour.
 Sci. Agric. 1932 : 13 : 185-93.

Black and white smooth-awned wheats were found among the progeny of strain II-15-55, a Marquis x Iumilla cross. The investigations showed that awn colour was due to one factor, with black dominant. One main factor is responsible for roughness of awns but there are indications that at least one auxiliary factor is also present.

There was no linkage between colour and texture of awns. A natural cross and a gene mutation are suggested to account for the origin of smooth awns.

305. GORDON, W. L. and WELSH, J. N. 633.13-2.452:576.16:631.521.6
Oat stem rust investigations in Canada.
 Sci. Agric. 1932 : 13 : 228-35.

An account is given of the physiological forms of the fungus found in Canada, of their relative prevalence, virulence, etc. The least virulent are the most widespread and have caused the most damage.

Only with one form, form 8, could artificial inoculation of the teliospores on the barberry be effected. From these, forms 6, 7 and 8 were produced, shewing the heterozygous nature of form 8. All these were more virulent than the common forms and had been isolated previously. Only one form was isolated from a single aecial cup.

Heigira Strain, resistant to forms 1, 2, 3, 5 and 7 has been crossed with the most productive forms. Resistance to the whole group of forms was found to depend on one dominant factor, seedling and field reaction being identical.

Heigira Strain was also crossed with Joannette Strain, containing an independent factor for resistance to form 4. Nine lines possessing both factors were isolated.

Further crosses to combine resistance to form 4 with resistance to loose and covered smut have been effected.

306. MAJMUDAR, V. M. 633.174:581.466:575.11.061.6
Inheritance of anther colour in Rabi jowars (*Andropogon sorghum*) as studied from a natural cross.
 Poona Agric. Coll. Mag. 1932 : 24 : 23-25.

The inheritance of this character has thus far hardly been studied, although being easy of observation it is very useful for purposes of breeding.

One of the heads of Jowar strain No. 8, which had remained pure for red anthers for a number of years, gave a progeny of red and yellow anthered heads in the proportion 2.7 to 1.

In order to investigate whether this mother head was a natural cross of No. 8 with some yellow anthered type, several heads, both red and yellow anthered, from the progeny above, were selfed. The data obtained in the F_2 generation shew a segregation of colour in the ratio 2.7 to 1. They thus confirm the supposition that the mother head was derived from a natural cross and shew further that the inheritance of the character is governed by a single factor pair.

The F_3 generation obtained by selfing red and yellow anthered heads shews red to be dominant to yellow.

307. JACK, H. W., JAGOE, R. B., and LOWE, B. A. 633.18:575
Experiments with Padi in Malaya 1931-32, I. Breeding and varietal trials.

Malayan Agric. J. 1932 : 20 : 614-30.

An account of the variety trials made at the various experimental stations. Yield and maturation period were tested.

A brief analysis of the F_2 of certain crosses shewed that white glumes are dominant to straw-coloured glumes, long grain dominant to short, and broad to slender in simple Mendelian ratios. Crosses have been made to obtain a high-yielding, stiff-strawed variety.

Cross-pollination of not more than 1 per cent was observed.

308. POGGENDORFF, W. 633.18:581.162.3
Flowering, pollination and natural crossing in rice.
 Agric. Gaz. N.S.W. 1932 : 43 : 898-904.

A detailed account of the external conditions affecting anthesis at Yanco, New South Wales. The process of pollination is also described in detail. 0.044 per cent of natural crossing was observed at 40 cm.

309. HENDRICK, J. 633.42-2.411.1-1.521.6
The prevention of finger-and-toe in turnips. Liming and a disease-resistant variety.

Trans. Highl. Agric. Soc. Scot. 1932 : 44 : 52-63.

The results of liming on the resistance of varieties of turnips to finger-and-toe (*Plasmodiophora Brassicae*) on plots sown successively with turnips since 1915, shewed that though at first liming, to the point of producing a slightly alkaline reaction of the soil, in part checked the disease, the effect diminished in time and in bad years scarcely any sound roots were produced.

Tests of a number of so-called resistant varieties shewed these to be resistant but by no means immune until a variety known as Skene Purple Top Yellow was tried. Even on unlimed and fully infected soil, the majority of the bulbs were only slightly diseased and a quite adequate crop was obtained.

This resistant variety, which has been noted in "Plant Breeding Abstracts" Vol. I, Abst. 455, has been renamed the Bruce. Besides its disease resistance it is a good yielder with a high percentage of dry matter.

310. HUTCHINSON, J. B. 633.51:575.11.061.6
The genetics of cotton. Part VIII. The inheritance of anthocyanin pigmentation in Asiatic cottons.
 J. Genet. 1932 : 26 : 317-39.

This paper constitutes the eighth dealing with the genetics of cotton to be contributed by the Cotton Research Station in Trinidad. Previous investigations on the inheritance of anthocyanin in the Asiatic cottons have been limited to studies on its occurrence in the leaf and petal. Three forms were recognized; red with anthocyanin distributed throughout the plant, Spot with a red spot at the base of the petal and spotless with no anthocyanin developed at all. Here six

distinct types of distribution are recognized; Red (R) corresponding to the red above, Red Leaf (R_1) with anthocyanin in petal spot, calyx, bracts, leaves, bracts, stems and bolls but not lobe of petal, Red Calyx (Rc) with colour in petal-spot, calyx, bracts, stems and bolls but not in lobe of petal or of leaves, Spot (Rs) with colour in stems and petal-spot only, the commonest type in all species, Spotless (ro) with colour in hypocotyl only, and Ghost Spot with no anthocyanin developed at all and the spot at the base of the petal represented as a white ghost. It will be noticed that the term 'Spotless' is used in a sense different from that given by previous investigators and it is more than probable that their spotless is the present Ghost Spot.

A series of experiments in which the above six distributions were crossed in all combinations, indicates the presence of a multiple allelomorph series of six members limiting the distribution of anthocyanin into progressively fewer areas on the plant. It is noteworthy, however, that the cross between the two lowest members of the series (ro and rg) gives a new form, termed Spot/Ghost, with a certain amount of pigment in the stem and hypocotyls but, in the centre of the clear white area on the petal, a pigmented spot. The two lowest members of the series are, thus, to some extent, complementary. There is, further, indication of the presence of intensifying factors for, when the F_1 of $R_1 \times ro$ was crossed to ro and rg, the segregates in the back-cross to Ghost Spot type carried a consistently darker pigmentation than the segregates in the back-cross to Spotless type. There is evidence that repeated back-crossing of Spot/Ghost to Ghost with the object of breeding a Spotless type carrying a complete set of *G. arboreum* modifiers, a uniformly full Spot type would be produced; conversely, by back-crossing to eliminate the modifiers, a new type of Ghost would be produced which would be completely dominant over Spotless. The influence of the colour factor (Y) in modifying the distribution of the anthocyanin pigment in the petal is also noted.

Since red cottons have been used as high quality parents in India, there is a certain economic value in the experiments to determine whether the genes for desirable lint characters are associated with genes of the anthocyanin multi-allelomorph series. Crosses with this object in view indicate that genes affecting lint length and seed weight exist in the same chromosome as the anthocyanin multi-allelomorph series but only a very small proportion of the lint length and seed weight variation is determined in this manner. The R series has been found to segregate independently of the Y series influencing petal colour and of A, one of the two complementary genes for "crumpled."

Lastly, it is noted that many of the yellow-flowered varieties of *G. arboreum* carry a red tinge along the edge of the petal exposed in the bud. Such tinged petals have never been found in *G. herbaceum* and there is here additional evidence for grouping the cultivated Asiatic cottons into *G. arboreum* and *G. herbaceum*.

311. SEN, K. R.

633.51:581.471:575.22:677.2

On the variation of certain characters of cotton in relation to the position of seeds in a lock, with a statistical note by S. Subramonia Iyer.
Ind. J. Agric. Sci. 1932 : 2 : 484-98.

The effect of the position of the seed in the lock on lint weight was investigated in three varieties of Punjab-American cottons. There was a correlation, on the whole, between seed weight and lint weight. The maximum seed and lint weight occurred in the position towards the base. Further investigations were made on the Early Strain where it was found that the fibres from the seeds nearest the base have comparatively higher weights per unit length than the fibres from seeds in other positions. Average fibre length was about the same in all positions. Ginning percentage was highest for the seeds nearest the base. There was no correlation between mean seed weight and mean average fibre length or mean number of hairs per seed. The statistical note appended shews that the differences in the three characters examined with regard to the position of the seed in the lock are due to some cause other than mere random sampling fluctuations.

312. FOWLIE, P. 633.61(92.2)
Notes on the new sugar cane varieties which are now free from quarantine restrictions and available for commercial planting.
 Proc. 6th Ann. Gen. Meet. and Cong. S. Afr. Sug. Techn. Ass. 1932 : 43-48.
 The variety CH. 64/21 is a cross of Uba and D. 74. In Cuba it proved more vigorous than Uba. The P.O.J. Nos. 2714, 2725, 2727 and 2878 have been selected for their resistance to mosaic disease and high sucrose content. The relative values of these canes is indicated. CO. 290 is of interest on account of its resistance to drought. It requires a good soil, but grows quickly and is resistant to mosaic and streak disease.

313. L., H. M. 633.61:575
Dr. C. A. Barber, C.I.E., Sc.D. A memoir.
 Int. Sug. J. 1933 : 35 : 93-95.
 A review of the multifarious interests and activities of the late scientist, including brief reference to the contributions he made to sugar cane classification and breeding.

314. **Sugar-cane research in Coimbatore.** 633.61:575(54.8)
 J. Soc. Chem. Ind. Lond. 1932 : 51 : p. 865.
 Attention is called to the success expected from the recently produced sugarcane-sorghum hybrids and the canes of medium thickness which give satisfactory yields with less attention, water and manure.

315. 633.61:575(72.98)
 McINTOSH, A. E. S. 633.492:575.42(72.98)
Report of the Geneticist.
 Agric. J., Barbados, 1932 : 1 : p. 1.

The report deals with the three crops, sugar cane, sweet potato and cotton of which the first, as is natural in Barbados, dominates.

Sugar Cane. Small as the island is, the conditions are sufficiently varied to render a single variety inadequate; there is a 'place' factor as well as a 'time' factor to which the variety must be adapted. The points of major importance are (1) increased weights, (2) retention of weight throughout the crop, especially important in the drier districts, (3) commercial resistance to gumming disease and (4) earlier juice ripening in the rainier districts. Efforts to attain these desirable characters are directed along two lines, (1) intercrossing Barbados varieties of different 'lines' of descent and (2) crossing Barbados 'male' varieties of good juice-quality-endowing capabilities with Javan varieties and back crossing the best on to the same 'male' variety. The Java-Barbados hybrids were also selfed.

A list of the crosses and the number of each retained as the result of the first year selection is given. While the relative influence of the 'male' parent is worked out for each character on the basis of averages, it is pointed out that these averages have only a limited value for the selection of promising seedlings, since some of the most promising appear in families with relatively low average. Several crosses of P.O.J.2364 with Barbados 'male' parents had exceptionally good weight and appearance but low sucrose percentage and will be used for back-crossing.

Second year seedlings, selected to approximately twenty, of the three groups early, medium and late, were tested on randomized plots at two stations representing high and low rainfall. Five varieties have survived this test and will be tested further under the conditions to which they appear most appropriate.

Variety trials of twelve plant canes and six ratoons were made at three stations involving determinations of tonnage and of sucrose percentage in the juice. None of the newer seedlings have, however, reached this stage. An early and a late reaping was taken of each variety plot of the plant cane tests. The major point of interest in these tests is the heavy drop in the tonnage of certain of the varieties at the second reaping. This drop is by no means general for the island and emphasizes the necessity for trials in each district. Observations of the various varieties in these tests are given at some length.

Maturity tests of a large number of varieties at two stations and embracing three reapings are recorded. These show well the varietal responses to the 'time' and 'place' factors.
Sweet Potato. Results are recorded of tests of a large number of varieties, both seedling and imported, under catch-crop (July to November) and long-crop (September/November to March) conditions. As a result of these tests, a number of selections have been made.

316. THOMAS, R. 633.61:575.252
Bud variations in Co. 213 sugarcane.
 Ind. J. Agric. Sci. 1932 : 2 : 531-35.

The occurrence of bud variations has been known for a long time, colour sporting being the one most easily noticed.

On a plot planted with Co. 213 the four different bud variations, as follows, were obtained :

- "Striped Sport" otherwise like the original ones.
- "Thick Purple Sport" similar in colour and thickness to Co. 213.
- "Thin Purple Sport" with thinner canes and smaller leaves than Co. 213.
- "Thin Yellow Sport" of wax-yellow colour.

All these sports remained true to type during the following years.

The examination of growth vigour, lamina, juice quality and root-system shews the "Striped Sport" and "Thin Yellow Sport" to be degenerate bud variants and the "Thick Purple Sport" a type of possible superiority to the normal cane.

317. HILL, A. G. 633.61-1.535:578.082
A note on the rapid multiplication of new cane varieties.
 Int. Sug. J. 1933 : 35 : 101-02.

A method is described by which a new variety or seedling can be multiplied with extreme rapidity by planting out every aerial bud in the stool.

318. 633.79:575(42)
Report by Arthur Guinness, Son and Co., Ltd. on Manitoba, New-Mexican and Oregon crosses grown at East Malling, 1930 and 1931.
 J. Inst. Brew. Lond. 1933 : 39 : p. 29.

The order of merit of a number of new hop varieties together with a standard is given with respect to antiseptic value and flavour.

319. BUNTING, B. 633.855.34:575(91)
Experimental work in relation to oil palms.
 Malayan Agric. J. 1931 : 19 : 65-73.

The article contains remarks on seed selection. The highest yielding palms have been crossed and selfing has been effected by retaining the pollen until the female inflorescence was ready for pollination. The progeny are being tested under field conditions.

Increases of up to 330 per cent in weight of cleaned fruit were obtained by artificial pollination. The ill effects of over-pollination are emphasized however, and experiments are now in progress to test the possibility of pollinating only one inflorescence per month.

320. DAVEY, M. 634.1/2-1.521.3
A system for selecting varieties of fruit-trees.
 N. Z. J. Agric. 1932 : 45 : 227-29.

As an aid to the selection of varieties of fruit trees, the various qualities required in a fruit for commercial purposes are given numerical values with the sum of 100. The suggested system is as follows :—ruling market values of a variety, 25 ; comparative yield, 10 ; freedom from disease, etc., 20 ; dessert quality, 10 ; cooking quality, 10 ; harvesting and packing, 5 ; constitution and vigour of tree, 5 ; storage life of fruit, 15.

321. PALMER, R. C. and STRACHAN, C. C. 634.11:575.252
Bud variation in the apple.
 Sci. Agric. 1932 : 13 : 178-84.

The original McIntosh apple was probably red, bud sports bearing striped apples are however of frequent occurrence but are of less commercial value.

Bud sports occur on the striped Delicious variety with red fruit. Careful analysis shews that when such fruit is harvested too soon the colour and quality of the flesh is inferior to that of the striped fruit.

It is therefore of importance that characters other than external colour should be taken into account before it is assumed that the variation is a real improvement.

322. CRANE, M. B. 634.11:576.312.32:581.162.3
The chromosome constitution and pollination of apples.
 Gdnrs.' Chron. 1932 : 92 : 309-10.

The occurrence of triploidy in many cultivated apples is pointed out, a list being given of the diploid and triploid varieties. Comparing this with results of pollen germination it is shewn that the triploids have markedly lower quality of pollen.

In growing triploids therefore it is advisable to interplant two suitable diploids, so that these may pollinate the triploid and also each other.

There is evidence that many pears are also triploid.

323. CHEESMAN, E. E. 634.771:575.12:576.354.4
Genetic and cytological studies of *Musa*, I. Certain hybrids of the Gros Michel banana.
 J. Genet. 1932 : 26 : 291-312.

The present investigation was the outcome of an attempt to combine the commercial properties of Gros Michel with resistance to the Panama disease.

Gros Michel used as the female parent was found to possess 33 diploid chromosomes and not 32 as previous authors have stated. The cytological study of meiosis of the pollen mother cells shewed many irregularities.

The male parent, a seeded variety, named provisionally *Musa malaccensis*, had 22 diploid chromosomes and meiosis was mainly regular.

The four F_1 hybrids obtained could hardly be distinguished from Gros Michel or from each other. One, however, later renumbered I.C.1 was found to be immune to Panama disease. This one was therefore examined in greater detail. The diploid chromosome number was 44, probably representing 33 from the female parent and 11 from the male. Meiosis was irregular, the viable pollen grains probably had 22 chromosomes.

Dwarf plants occurred among some F_1 hybrids raised later and chromosome counts gave 74 and 75 somatic chromosomes.

Selling of I.C.1 revealed marked self-incompatibility and only 5 plants in all have been raised. They resemble their parent in vegetative habit, 3 have 44 $2n$ chromosomes and 2 have 46. None has yet flowered.

Only one plant was obtained from back-crossing I.C.1 on to Gros Michel. Chromosome counts gave between 37 and 42 and meiosis was very irregular.

Pollen from I.C.1 and one of the other F_1 hybrids was used in a back-cross to the male parent. Seed set freely and germinated well. F_1 was heterogeneous but with the habit of Gros Michel and the fruit-bunch intermediate in size and position between the parents. The fruits were parthenocarpic. The chromosome number for 14 individuals was 33 $2n$. Meiosis was fairly regular but lagging was observed with a tendency towards elimination of chromosomes. The results suggest that 11 is the basic number for *Musa*.

The theory of an unreduced egg cell to explain the 44 chromosomes in the F_1 hybrid is not altogether satisfactory and other possibilities are discussed. The occurrence and significance of secondary polyploidy is also noted.

324. CHEESMAN, E. E. 634.771:575.12:576.354.4
Genetic and cytological studies in *Musa*, II. Hybrids of the Mysore banana.
 J. Genet. 1932 : 26 : 313-16.

The cross in question was between *M. malaccensis* and the edible banana known as Mysore with 33 2n chromosomes and meiosis similar to that of Gros Michel.

Nine F_1 plants were examined, 6 had 44 2n chromosomes, were of normal habit, 2 of these were parthenocarpic and 1 was not, data is not yet available for the others; 2 were thick-leaved dwarfs with $75 \pm$ and $73 \pm$ 2n chromosomes; 1 had probably 33 2n chromosomes and the wild type habit.

Mysore was also crossed with pollen from I.C.1 but only 2 plants were obtained, both thick-leaved, 1 a dwarf with 90 2n chromosomes and the other more vigorous in habit with 54—55 chromosomes. Neither has yet flowered.

325. CHEESMAN, E. E. 634.771:575.252
Mutant types of the dwarf banana.
 Trop. Agriculture 1933 : 10 : 4-5.

The commercial importance of the dwarf or Canary banana has prompted botanical investigation of a large collection of specimens. This has disclosed the existence of a number of mutants which have arisen by bud mutation. Some of these differ very considerably from the dwarf type, one displays close resemblance in some characters to the tall banana.

A mutant of particular interest is described which displays all intermediate conditions between completely naked rachis and persistence of all bracts. This illustrates how it is possible for the naked forms to have arisen by mutation from *Musa Cavendishii*.

326. BOYES, D. 635.1/6:575(42)
Plant Breeding at the Cambridge Horticultural Research Station.
 Hort. Educ. Ass. Yearb. 1932 : 1 : 27-36.

This article is an account of some of the work in progress. The crops now under investigation are:—Brussels sprouts, broccoli, cabbages, cauliflowers, beans (for canning), celery, gherkins, lettuce, onions, parsnips, peas and strawberries. A detailed account is given of the breeding of Brussels sprouts, the qualities desired and the difficulties encountered and overcome. There is also brief mention of the work on other *Brassicæ* and on the production of beans for canning purposes.

327. DIXIT, P. D. 635.657:575.242
Studies in Indian pulses : a case of gigantism in gram (*Cicer arietinum*.)
 Ind. J. Agric. Sci. 1932 : 2 : 391-408.

Giant mutants were observed in a strain of *Cicer arietinum*. They were rather sterile but bred true.

Sixteen 2n chromosomes were found instead of the fourteen of the normal type.

It is suggested that this form should rank as a new species known as *Cicer gigas*.

328. DIXIT, P. D. 635.657:576.312.5:575.242
Studies in Indian pulses. A note on the cytology of "Kabuli" and "Desi" gram types.
 Ind. J. Agric. Sci. 1932 : 2 : 385-90.

Crossing between the ordinary types of gram, *Cicer arietinum* and a white, large-seeded Kabuli gram has been found difficult.

A cytological investigation shewed that the ordinary types had fourteen 2n chromosomes, as had been previously reported, but Kabuli gram had sixteen 2n chromosomes and is regarded as having probably arisen as a mutation.

It is suggested that it should be treated as a distinct species.

Part II. Foreign.

GENETICS 575

329. RATHLEF, H. v. *Genetik, Pflanzenzüchtung und Sortenkunde in Russland und den skandinavischen Ländern. (Genetics, plant breeding and variety tests in Russia and in Scandinavia.)* Pflanzenbau (Lpz.) 1932 : 9 : 109-25. 575:47+48

A short account of the work carried out mainly since 1925 is given.

Papers on plant physiology and the geographical distribution of varieties are briefly reviewed. They are considered as a basis for the investigations of the origin of varieties, among which the theories propounded by Vavilov are emphasized. The main papers on classification and taxonomy are briefly reviewed. In the work done on the combination of genes, the chief stress is laid on Nilsson-Ehle's theories of inbreeding and on the effect of X-rays on mutations, as considered by Rosanov and Serebrovski.

330. WEINBERG, W. *Die Güte der Prüffunktionen Geschwistermethode und Weinberg-Apert-Bernstein-Methode verglichen mit der direkten Methode bei vollständigem oder vollständig repräsentativem Material. (The comparative value of the sister method and the Weinberg-Apert-Bernstein method as test functions and of the direct method with complete or completely representative material.)* Z. indukt. Abstamm.-u. VererbLehre. 1933 : 63 : 420-24. 575:519.24

The discussion of these methods shews that the coefficient of heredity p can be determined by comparing the empiric value obtained by the direct method with the empiric result of the sister method.

331. R. . . . J. M. *Multiplicación de semillas seleccionadas. (Multiplication of selected seed.)* Agricultura, Madrid 1932 : 4 : p. 797. 575:578.08

A brief description of the methods adopted by the Association Belge des Producteurs de Semences Améliorées for multiplication and retention of purity of the new varieties created by the Gembloux plant breeding station.

332. TSCHERMAK-SEYSENEGG, E. *Künstliche Belichtung als Stimulationsmittel in Gewächshäusern im Dienste der Pflanzenzüchtung. (Artificial illumination as a stimulation medium in greenhouses as an aid to plant breeding.)* Gartenzeitung, Wien 1932. 575:578.082

The various advantages to be gained by the breeder by the use of artificial light are indicated and methods suggested for improving the success with certain plants. Neon lights have often given better results than electric light.

The author's own experiments were unsatisfactory with certain plants, e.g. cereals, peas, beans, etc. *Phaseolus* on the other hand gave excellent results, hybridizations could be carried out with more ease than in summer in the open and the F_1 grown without delay. The plants grown from the seeds produced by illuminated plants appeared to give higher yields than normal plants, apparently owing to a stimulation effect. Further experiments are being set up to test this observation.

333. CREBERT, H. *Beiträge zur Lichtbildtechnik des Pflanzenzüchters. (Contributions to the photographic technique of the plant breeder.)* Züchter 1933 : 5 : 8-13. 575:578.087

The size of the camera recommended for pictures in plant breeding experiments is 9 x 12 cm. The use of a yellow glass is always advisable.

Further indications are given on taking general pictures in the fields. For pictures of single plants previous potting is recommended. Minute objects, such as grains, ears, etc., are best taken in the shade. For this purpose a special lighting apparatus has been worked out by Kattermann. Indications are given on the light to be used for taking contours and on preparing diapositives.

334. SINNOTT, E. W. 575.11-181:581.47
575.11.061.1:581.47
Two modes of developmental control by shape genes.
Amer. Nat. 1933: 67: p. 71. (Abst.).

Plotting length against width in developing cucurbit fruits produces a straight line. The slope of the line for different fruit shapes is the same but the level is different. Thus shape is genically determined and not due to differences in relative growth rate.

In *Capsicum* and *Vigna*, however, the fruits differing genetically in shape did shew different slopes, and shape differences become more pronounced as development progresses.

335. ANDERSON, E. 575.113.4:575.127.2:633.71
Character recombination as a genetic tool.
Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: p. 2. (Abst.).

By studying the recombination of multiple factor characters with single factor characters insight can be gained into the inheritance of the former. An analysis of the F_2 of a cross of *Nicotiana alata* x *N. Langsdorffii* indicates the presence of large numbers of multiple factors distributed throughout the chromosomes.

336. WARWICK, B. L. 575.114:519.24
Probability tables for Mendelian ratios with small numbers.
Bull. Tex. Agric. Expt. Sta., 1932: 463: Pp. 28.

The purpose of this communication is to provide, and explain the use of, a table giving the terms of the binomial series $(q + p)^n$, for n going from 1 to 50, and for simple fractional values of p going down from $\frac{1}{2}$ to $1/256$. q is equal to $1-p$, and the table is constructed to four places of decimals.

337. TIKHONOW, P. M. 575.115
(A contribution to the question as to the relativeness of the phenomena of dominance.)
Bull. Appl. Bot. Leningrad 1932: Ser. A (3): 151-55.

In a cross of round x wrinkled peas the F_1 was clearly distinguishable from the parental round form, in that the peas were slightly elongated and cornered instead of being perfectly round. Such forms appeared again in the F_2 , and their heterozygous nature was confirmed in the F_3 . The starch was also of intermediate form in the heterozygotes, as was also the percentage of sugar. Hybrids between a spring wheat with pubescent first leaf and a glabrous winter wheat shewed an intermediate number of hairs, being also of two types, long like the spring parent and short like the winter parent. The heterozygote did head, in contrast with the winter parent, but was later than the spring form. It was also intermediate in the carbohydrate content at reduced temperature.

Wheat-rye hybrids are described which were intermediate in ear form, the earliest varieties were awnless like the wheat, later ones semi-awned and the latest of all nearly fully awned. This is a particularly clear illustration of the interaction of the gene and the external medium in the expression of a character.

Reference is made to cases observed by other investigators in which the expression of a character in the heterozygote and sometimes even in the homozygote, is influenced by growth conditions. Certain cases apparently of this type have been ascribed to somatic segregation.

338. **COFFMAN, F. A.** 575.125
Heterosis : specific not general in nature. 633.13:575.125
 Hecione 1933 : 77 : 114-15.

In studies of heterosis, variable results were obtained from different crosses of oats. While in one cross of Richland x Fulghum and Richland x Markton, the F_1 plants were taller, bore more culms, weighed more and yielded more grain than the larger parent, the F_1 plants of another cross displayed only an increased grain yield and grain-straw ratio.

The fact that in some F_1 hybrids only a single plant organ shows an increased size, which is due to the bringing together in the F_1 of the growth factors present in both parents, indicates that the parts of the plant are not closely linked and that heterosis does not extend to all of them.

339. **WETTSTEIN, F. V.** 575.127:576.356.5:576.16
Bastardpolyloidie als Artbildungsvorgang bei Pflanzen. (Polyploidy of hybrids as a process of species formation in plants.)
 Naturwissenschaften 1932 : 20 : 981-84.

Various characteristics of polyploid plants are enumerated. The occurrence of polyploid series, which can be shown by a study of the individual chromosomes to be due to duplication, has been demonstrated in many plant genera. The absence in natural polyploid species of the irregularities commonly associated with polyploids is also pointed out. This is ascribed in certain genera to apomixis, in many to the origin from a sterile hybrid by chromosome duplication. The latter type of polyploid is usually free from the said irregularities when produced experimentally. Attention is called to the large proportion of cultivated plants which are of this type.

A liverwort in possession of only half the haploid number of chromosomes which is yet fertile and constant is described. When its chromosomes were duplicated by regeneration the haploid produced displayed all the irregularities of a polyploid but when the hemiploid was crossed with another, different liverwort species it gave a duplicated hybrid similar to the original species.

340. **WEBBER, H. J.** 575.22:634.3-1.547.25
Variations in citrus seedlings and their relation to rootstock selection. 634.3-1.541.1
 Hilgardia 1932 : 7 : 1-79.

This paper deals with the reaction of scions caused by variable rootstock seedlings and the means of improving the citrus nursery stock.

It has been observed that citrus seedlings grown from the seed of the same variety exhibit a wide range of variation : 5 to 40 per cent of them differ from the prevailing type of seedlings and are therefore called variants. Apogamy occurs sometimes to a high degree in citrus varieties, there is evidence that seedlings of the prevailing types originate from apogamic embryos, while variants are produced by sexual embryos, sometimes by cross-fertilization but mainly by self-fertilization. These variants generally lack vigour and, if used as stocks, invariably have a dwarfing effect on the trees.

In one experiment buds of different size of Washington Navel and Valencia oranges and of Marsh grapefruit were propagated on sweet-orange stocks. They showed in all but one of the nine plots a continued superiority of selected large buds over small ones.

Another experiment with 389 trees of Washington Navel orange on sour-orange stocks gave results as follows : the seedlings were segregated into large and small ones. The latter contained 43 seedlings of variant types which later showed a dwarfing effect on the orchard trees budded on them. Seventy-seven per cent of these variant types had been graded as small at the seed-bed stage.

These seedlings of variant types, if propagated on sour-orange and Rough-lemon stocks, maintained their varietal characteristics unchanged by the influence of the stock. The latter is apparently limited only to quantitative characters.

Correlations are given between the trunk area, top volume and yields of the seedlings, buds and orchard trees.

All observations indicate that small seedlings and buds produce small, low-yielding orchard trees and that large seedlings and buds produce large, high-yielding orchard trees.

Therefore the main factor in the improvement of citrus nursery stock is the elimination of variant seedlings which were found to produce dwarfed orchard trees. This elimination can be done best by removing the small seedlings in the seed-bed and destroying the variants and small seedlings before budding.

A selection based on the size of the seedlings or of the buds remaining after the elimination of the variants is also recommended.

341. KOBEL, F. 576.16
Die Entstehung neuer Formen im Pflanzenreich. (The origin of new forms
in the plant kingdom.)
Vjschr. naturf. Ges. Zürich 1932 : 77 : 22-35.

Following upon a popular explanation of the mechanism of inheritance and of mutation, it is shown how gradual accumulation of mutations, together with chromosome irregularities, duplications, etc., and especially those resulting from wide crosses, afford a sufficient explanation of the evolution of the present plant species. The examples are drawn largely from cultivated plants.

Studies of the cytoplasm have shown, and will in the near future show still more, the author says, the importance also of this in inheritance and evolution.

342. BAUR, E. 576.16
Artungrenzung und Artbildung in der Gattung *Antirrhinum*, Sektion
Antirrhinastrum. (Species delimitation and formation in the genus
Antirrhinum, Section *Antirrhinastrum*.)
Z. indukt. Abstamm.- u. VererbLehre. 1932 : 63 : 256-303.

A study was made of a number of wild species.

The results show that morphologically similar wild types are usually factorially similar.

The flower colour factors familiar in the cultivated forms play no part in the colour differences between the wild types.

In certain crosses between species double recessive segregates appeared in respect of characters for which both species were homozygous dominant. Altogether a much greater variety of types segregated from crosses between species than that manifested by the wild types of the region where the two species concerned grow. Many, but by no means all, of these new combinations are at some disadvantage in natural conditions of growth.

Nearly all wild forms are highly self-sterile, although in culture fertile mutants have been observed.

343. SAX, K. and ANDERSON, E. 576.356.2
Segmental interchange in chromosomes of *Tradescantia*.
Genetics 1933 : 18 : 53-67.

Chromosome pairing at meiosis was studied in normal diploid, a tetraploid, and segmental interchange plants.

The occurrence of rings and chains of chromosomes and the distribution of chiasmata are noted. On the position and number of the chiasmata in the chains and rings depends in part the proportion of fertile and sterile types of segregation found.

Pollen sterility depends also on the amount of non-disjunction. A comparison of the amount of non-disjunction in *Tradescantia* and other plants shows that the position of the chiasmata and the relative length of the chromosome segments have an influence on the amount of non-disjunction. The occurrence of inter-locked bivalents was frequently observed and their significance is discussed.

344. BRUMAN, A. J. 578.082:581.143.26
"Iarovization." A new factor in plant breeding technique.
J. Hered. 1932 : 23 : 465-66.

An account of the article by A. A. Sapëhin in *Züchter* 1932 : 4 : 147-51. See "Plant Breeding Abstracts," Vol. III, Abst. 33.

345. HARDER, R., KEPPLER, E. and REUSS, H. 581.13/4:578.082
 Beobachtungen über das Pflanzenwachstum und die Kohlensäureassimilation
 bei Kohlensäuredüngung und nächtlicher Zusatzbeleuchtung. (**Observations
 on plant growth and assimilation of carbon dioxide with artificial
 supply of carbon dioxide and illumination at night.**)
 Gartenbauwissenschaften 1931 : 5 : 389-428.

The combined application of carbon dioxide and artificial light induced the flowering of the hydrangea variety Madame Moullière 35 days earlier than usual. The whole development of the plants was more luxuriant. The same effect was observed on other hydrangea varieties and ornamental plants.

Strawberries under the above treatment produced fruits even in winter.

The intensity of assimilation increased in all the five experimental plants on increasing the CO₂ content of the air, but only if the plants were absolutely normal and healthy.

346. *MOSHKOV, B. S. 581.143.26.035.1
 (Photoperiodism in trees and its practical importance.)
 Bull. Appl. Bot. Leningrad 1932 : Ser. A. (2) : 108-23.

Experiments were executed on a variety of ornamental fruit and nut trees growing near Leningrad, from which it was demonstrated that in these, as in other plants, long, intermediate and short day forms exist. The two latter types completed their vegetative cycle more rapidly when the period of illumination was reduced ; this treatment also increased the frost resistance and the second group shewed an enhanced vegetative development at the same time. The reaction of different species of the same genus differed widely, each individual apparently having an optimum photoperiod.

The " after effect " of the reduced day was also demonstrated ; a treatment of certain members of the second group for only fifteen days with a ten hour day, followed by normal conditions, was enough to double the annual growth.

Attention is called to the importance of these observations for introduction and breeding. Hybridization is made possible with trees which normally do not flower and in any case the reproductive phases can be accelerated and breeding thus very much facilitated.

347. FRANSSEN, C. J. H. 581.162.3:633/4(92.2)
 De beteekenis van *Apis indica* als bloembestuivend insect. (**The importance
 of *Apis indica* as a flower pollinator.**)
 Bergcultures 1932 : 6 : 1417-23.

Recent researches of Minderhoud in Wageningen have shewn that bees do not play quite such an important role in the fertilization of temperate fruit trees as was originally supposed.

The habits of the bee in Java are briefly described in so far as they affect pollination. The observations are then discussed in relation to various crops.

The bees are differentiated into water, pollen and nectar gatherers and do not fly from tree to tree. Hence the possibility of pollination is excluded in the coconut except when male and female flowers are present on the tree at the same time. In consideration also of the presence of wild bees in nearly every coconut plantation there is no point in introducing hives.

Similarly in kapok, which is self-pollinated, fertilization is effected during the night before the bees begin to fly. Moreover fruit set is equally plentiful in the absence as in the presence of bees ; and in coffee, which is only rarely visited by bees and sets equally well in their absence, pollination by bees is quite rare and cross-pollination almost non-existent ; in cacao, tea, pepper, *Hevea*, bees play an equally little role in pollination and in oil palm they visit the male but not the female flowers. In this and in the leguminous and other plants discussed, the majority of which are not visited, the role played by bees is regarded as negligible.

348. STOPPELAAR, J. J. DE 581.162.3:633/4(92.2)
De beteeckenis van *Apis indica* als bloembestuivend insect. (The importance of *Apis indica* as a flower pollinator.)
Bergcultures 1933: 7: p. 13.

The author dis agrees with the opinion expressed by Dr. Franssen (see foregoing abstract), that *Apis indica* plays little part in pollinating coffee.

349. YASUDA, S. 581.162.52:581.036
Physiological researches on the fertility in *Petunia violacea*, XI. On the effect of temperature upon self fertilization.
Bot. Mag. Tokyo 1932: 46: 679-89.

The experiments as follows were made by the author:—

Self-pollination was carried out on some incompatible plants; part of them were kept in a hot glasshouse, the others in a cool glasshouse. Cool weather proved more favourable to seed bearing than hot.

In thirty flowers left unpollinated, no parthenogenesis took place.

By smearing the pistils with pollen from another plant kept under medium conditions, it is shewn that the cool weather acts on the character of the pistil and not on the pollen.

Evidence is given that the cause of self-fertilization in cool weather is not due to an increased life-duration, but to a less pronounced formation, in the style, of inhibiting substances.

350. FERGUSON, M. C. 581.331.2
The morphology of the pollen grains of *Petunia* in relation to hybridity, polyploidy and sterility. A preliminary communication.
Proc. 6th. Int. Cong. Genet. N.Y. 1932: 2: 52-53. (Abst.)

"Bad" pollen is defined as grains which have a comparatively thick wall and which do not change their shape and size in an aqueous medium.

The large amount of variation in the pollen observed in hybrids between *P. axillaris* and *P. violacea* is found to be genetical and not due to environment.

Variation in the shape of the pollen grain is not found to have any close connection with sterility.

351. ALEKSANDROV, V. G. 581.4:575:633
(The anatomy of plants and plant breeding).
Bull. Appl. Bot. Leningrad 1932: Ser. A (3): 37-52.

Various cases are cited in which anatomical studies have been applied to plant breeding, flax above all having been successfully bred in this way. The sole institution in the world for studies of this nature is the Anatomical Laboratory of the Department of Genetics and Breeding of the Institute of Plant Industry.

The extreme plasticity and variability of the anatomical structure of the organs interesting the breeder are emphasized. By colouring the material in safranin for a little over 24 hours before embedding much time can be saved. Similarly by dissolving a little chrisoidin in the xylol used, the bast fibres are coloured yellow. Simpler and more economical methods of making the microphotographs are also described.

A reliable judgment of the proportion of bast fibres in a stem can be made only from that portion of the transverse section which lies between two leaf traces. The proportions between these fibres and secondary wood give an index of the richness of a line in fibre. This illustrates the object of anatomical studies—to accelerate and simplify the progress of breeding. Particular stress, however, is laid on the dependence of most anatomical characters on conditions of development and the care which these considerations make necessary.

Microchemical studies of the food reserves, as in cereals for example, may also give considerable aid to selection.

The necessity for studying the anatomy from all sides is made clear by reference to the opium poppy, where it is not so much the structure of the opium tubes as the area of the system of tubes which exceeds that of the common poppy.

AGRICULTURE 63

352. 63.00.15(46.9)

Relatório sobre a vida do Instituto Superior de Agronomia no ano lectivo de 1929-1930. (Account of the career of the Instituto Superior de Agronomia in the academic year 1929-1930.)

Anais Inst. Sup. Agron. Lisboa 1931 : 4 : 131-52.

Studies of the variation of vines in resistance to various epiphytic diseases, of the result of ultra-violet rays in influencing germination and producing mutations. Anatomical and physiological studies of various species and hybrids. Artificial hybridization.

353. GARBER, R. J. and PIERRE, W. H. 631.421:519.24

Variation of yields obtained in small artificially constructed field plats.

J. Amer. Soc. Agron. 1933 : 25 : 98-105.

The interest of this paper lies in the description of an experimental method which uses soil frames of small size, into which carefully mixed soil is introduced. Experiments were conducted over three years with wheat, soya bean hay and Sudan hay under such conditions. It is shewn that soil heterogeneity, in so far as it influences yield over a period of years, may be substantially reduced by mixing the soil. In individual years, however, the variation between plats was still too high for it to be concluded that replication was unnecessary. The plots were 1/1000 acre in area, and figures are given for the probable errors to be expected under various conditions.

354. NEYMAN, J. 631.421:519.24

O metodach opracowywania doświadczeń wielokrotnych. (On the methods of interpreting the results of multiple agricultural trials.)

Rocz. Nauk Rol. (Polish Agric. and For. Ann.) 1932 : 28 : 154-210.

When data exist on the results of multiple trials carried out at a number of experimental stations, and over a number of years, obviously more information should be available than is furnished as to the performance of a number of manures or varieties by the mean values over all stations and all years. Two treatments might give the same average values, but be of unequal value to particular farms, or in any single year. It is necessary to use the method of regression, which expresses the yield of treatment A, say, as a function of that of treatment B, so that we can determine the average effect of A when B is known to have a certain value, or range of values. The paper describes the statistical procedure, and gives the necessary formulae, not only for calculating the regression relationships, but also for the estimation of the precision of the regression constants obtained.

355. PARKER, E. R. and BATCHELOR, L. D. 631.421:634.3

Variation in the yields of fruit trees in relation to the planning of future experiments.

Hilgardia 1932 : 7 : 81-161.

A comprehensive examination is made of the yield and other data from a large number of Washington Navel orange trees cropped over a considerable number of years. The object was to study the variation of the material and to decide on the least methods of laying out experiments for future work, and on the size and number of plots to use. Statistical study shewed that the yields were distributed according to the normal form after the first year, and that thus the material was suitable for the application of the usual theory. Interannual correlations were found to exist for yields of individual trees and of plots. Methods of experiment designed to take account of this correlation are discussed, and the best way of pairing the plots, together with the use of check plots, is gone into in some detail. On the other hand the use of the Student method of paired differences was not found to be particularly advantageous over the direct method, owing to the smallness of the correlation between neighbouring plots in any one year. The experimental method suggested is to use four plots for each treatment, chosen on the basis of preliminary yield, and to supplement these by checks as continuity plots. Tree size was also studied in relation to yield, and prior knowledge on this point was held to be an advantage.

356. GASSNER, G. 632.111:578.08:575
 Methodik der Prüfung auf Winterfestigkeit bei Getreide und Nutzenanwendung der Ergebnisse für die praktische Pflanzenzüchtung. (*Technique for testing the winter-hardiness of cereals and its application in practical plant breeding.*)

Mitt. deuts. Landw. Ges. 1932 : 47 : 793-95.

The disadvantages attached to the old method of testing frost resistance in the field are pointed out, followed by a short account of the correspondence between resistance and the composition of the sap. The failure of the latter to give a reliable index of resistance is thought to be in part due to the impossibility of determining the cell sap contents apart from the contents of the protoplasm.

The artificial freezing method is then described, whereby the plants are first hardened at -2 to -6°C . before placing in a temperature of -12 to -13°C . or in special cases -15° , the experimental plants being compared with standard varieties.

On account of the expense a special institute has been established to make the determinations for all the breeders in Germany. The institute undertakes no breeding work on its own account.

357. STAKMAN, E. C. 632.4:575
 Problems in the genetics of phytopathogenic fungi.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 190-92. (Abst.)

The existence of a large number of physiological forms of many species of phytopathogenic fungi has made it necessary to modify in some cases the method for breeding for resistance.

Varieties with "general field resistance" to rust are now used as parents for breeding instead of trying to combine resistance to a number of physiological forms.

Physiological forms would appear to be the result of hybridization and mutation and shew definite genotypic differences. Complications in the study of the smuts are introduced by the various phases in the life history. New combinations still occur, sometimes more virulent than the old though many seem to be relatively innocuous.

A precise genetical explanation of saltation is still needed.

358. HONIG, F. 632.411.1
 Der Kohlkropferreger (*Plasmodiophora brassicae* Wor.) Eine Monographie.
 [The pathogene of club root (*Plasmodiophora brassicae* Wor.). A monograph.]

Gartenbauwissenschaften 1931 : 5 : 116-225.

The disease seems to have been known from the earliest days of the cultivation of *Brassica* and to be present in most countries.

The external effects on the plant are described as well as the anatomical, physiological and chemical changes involved. The possible causes of the disease are discussed and an account is given of the life history of the organism within and without the plant, as far as it is known.

A list is given of a large number of *Cruciferae* which have been investigated with regard to their susceptibility to the disease.

The experiments proving the existence of biological races are described.

The various methods of control are given. With regard to resistant varieties it is hoped that breeding may be able to produce immune varieties of turnips.

359. RICE, M. A. 632.451.2:581.162
 Reproduction in the rusts.
 Bull. Torrey Bot. Cl. 1933 : 60 : 23-54.

The views of other workers on the nature of the reproductive organs of the rusts and other fungi are discussed.

A cytological examination of spermatogonial and aecidial stages in *Puccinia Sorghi*, *Aecidium punctatum*, *Puccinia Violae* and *Uromyces Caladii* shewed the occurrence of projecting hyphae resembling trychogynes which could be traced to the spermatogonia but no evidence of fusion between them and the spermatia could be found.

360. GASSNER, G. and STRAIB, W. 632.452:576.16:575.242:633.11
 Ueber Mutationen in einer biologischen Rasse von *Puccinia glumarum tritici* (Schmidt) Erikss. und Henn. [Mutations of a biological race of *Puccinia glumarum tritici* (Schmidt) Erikss. and Henn.]
 Z. indukt. Abstamm.- u. VererbLehre. 1932 : 63 : 154-80.

A mutation of the yellow rust race Emersleben has been obtained in monosporidial cultures. This mutation called "New Emersleben" differs from the original by its capacity to infect a larger number of wheat varieties. While only a few varieties of wheat are susceptible to Emersleben, most of the German *Triticum vulgare*, especially the Squarehead varieties are infected by the New Emersleben. Thirty-four cases of this mutation have been observed. It remained constant for over thirty generations.

361. COTTER, R. U. 632.452:577.8
 Factors affecting the development of the aecial stage of *Puccinia graminis*.
 Tech. Bull. U.S. Dept. Agric. 1932 : 314 Pp. 38.

The susceptibility of the different species of barberry is discussed, together with general factors affecting infection. Amongst other things the results shew that when using mixed teliospores the aecia do not contain one physiological form only, but may contain several, some of which appear to be the result of hybridization.

362. GASSNER, G. and STRAIB, W. 632.452P. glumarum:576.16:633.11
 Die Bestimmung der biologischen Rassen des Weizenbraunrostes (*Puccinia glumarum* f. sp. *tritici* [Schmidt] Erikss. u. Henn.) [The determination of the biological races of yellow rust of wheat (*Puccinia glumarum* f. sp. *tritici* [Schmidt] Erikss. and Henn.).]
 Arb. biol. Reich. Land- u. Forstw. 1932 : 20 : 141-63.

The previous work on the subject is reviewed and the methods of investigation are described in detail. The choice of differential hosts was further studied and the tests of rust material from various localities in Europe and America established the existence of fourteen distinct physiological forms. The geographical distribution of the forms appears to be governed by the character of the prevailing wheats cultivated in the different parts of the world.

363. RADULESCU, E. 632.452 P. triticina:576.16:633.11
 Zur physiologischen Spezialisierung des Weizenbraunrostes (*Puccinia triticina* Erikss). [The physiological specialization of the brown rust of wheat (*Puccinia triticina* Erikss).]
 Kühn-Archiv 1932 : 33 : 195-205.

The paper deals with the determination of the physiological races of the fungus occurring mainly in Rumania, together with their geographical distribution.

Forty-nine brown rusts of different origin were examined, thirty-seven from Rumania and the rest from Germany, Sweden, Finland and Greece.

From the thirty-seven Rumanian cultures, ten forms were isolated, eight of which have previously been found in Europe. Forms 13 and 20 are the ones which occur most frequently in Rumania. The determination of the forms from the other countries is in agreement with that made by Scheibe. In Greece the new form 15 was isolated.

ECONOMIC PLANTS 633

364. LIEBER. 633:575(43)
 Die Pflanzenzucht im Lichte badischer Züchterarbeit. (Plant breeding in the light of breeding work in Baden.)
 Mitt. deuts. LandwGes. 1932 : 47 : 386-87.

Considering the special conditions for agriculture in Baden, as for example the high elevation of some districts, plant breeding is carried out only with local varieties.

The breeding work is mainly concerned with cereals, and to a lesser extent with potatoes, leguminous plants, turnips, flax and forage plants.

The institutions for plant breeding at present work in close co-operation with the seed firms.

365. SCHIEMANN, E. 633:576.16
 Einiges aus der Abstammungsgeschichte der Kulturpflanzen. (Contribution
 to the history of the origin of cultivated plants.)
 Züchter 1932: 4: 267-79.

The importance of the method applied by Vavilov according to which the origin of a genus or a species is located at the point where it displays its greatest multiplicity is emphasized. This centre of multiplicity appears to be also the centre of the genes. According to Vavilov five gene centres are found in the ancient world and two in America. The author gives a table in which most of the cultivated plants of Europe are shown to originate from one or other of these seven centres. The transformation of the original plants into the cultivated forms has resulted from factor mutations, aberrations of chromosomes or hybridization. Other cultivated plants are shown to have originated as weeds among cultivated plants. The cultivation of wheat has given rise to rye as a weed; that of barley, to oats; that of flax, to various oil and mustard plants.

366. ZHUKOVSKY, P. M. 633:581.9(47.9)
 (Resources of the Transcaucasian Republics for the breeding of grain
 crops and forage plants.)
 Bull. Appl. Bot. Leningrad 1932: Ser. A (2): 3-14.

In comparison with the remaining regions of the Soviet Republics, Transcaucasia has been very little studied and as the knowledge of this area develops, the diversity of its crops and the number of endemics becomes increasingly striking.

Pure cultures are more or less non-existent, every field consists of a motley of forms, varieties, species and even genera, these mixtures representing an enormous wealth of breeding material. In respect of wheat for instance this constitutes the richest source of breeding material in the Soviet Republics. In addition to a multiplicity of all known species of wheat it contains three completely new species unknown outside this region. Of soft wheat over forty varieties are present, mostly awned with red grain, and many displaying combinations of characters valuable for breeding in other parts of the country. Only in Armenia were white grained forms, absent entirely in Georgia, observed in quantity.

Durum wheats preponderate in certain parts of Azerbaijan and Georgia, some of these having the valuable character of gigantic ears and large grains, but weak straw; others with the reverse properties, together with earliness. As many as seventeen varieties were found. Constant and fertile natural hybrids between soft and hard wheats were found not infrequently.

T. turgidum is cultivated only in Azerbaijan. Types with vitreous grain were not infrequent. *T. persicum* is endemic to Georgia and parts of Armenia. The specimens found were entirely spring forms and characteristic of the highlands. They proved immune to *Erysiphe* in temperate zones but not in Tiflis. Its cold resistance and earliness also make this wheat interesting.

T. compactum is characteristic of Armenia, twenty-four varieties being represented.

Numbers of other wheats were also present in smaller quantities.

Of barleys the spring forms predominate, many-rowed forms being more common than two-rowed.

The varietal composition is limited and uniform. Earliness and immunity to frit fly are the most interesting features of the *mutans* forms. Smooth awned forms are not infrequent, sometimes in nearly pure culture. A very valuable 2-rowed variety *persicum*, characterized by high yield, drought resistance and earliness, was found in South Armenia.

Rye is present in nearly every wheat field, though rarely as a pure culture, except at the very limits of wheat cultivation, where rye almost entirely replaces the latter. Many of the ryes have high cultural value and their diversity is greater than that of the ryes of the whole of Europe. The abundance of coloured forms, large-eared non-shattering forms with adherent glumes, self-pollinating forms, early, spring and cold-resistant forms, makes it an invaluable fund of breeding material.

Oats are similarly found only as impurities but these are mostly highly cultivated types, amongst which are certain forms characterized by large grains, many spikelets in the panicle, tough articulation of the grain and "one maned" oats which are of extreme interest for introduction into cultivation.

Maize, although only of recent introduction, also presents highly original forms, most cultures being hybrid mixtures of dent and flint. Interest centres round some of the early maturing forms which have developed recently.

Both ordinary and Italian millets are common. No less than twenty-eight varieties of the former are present in Georgia alone and preliminary observations indicate the presence of material of great potentialities for breeding drought resistant forms.

Rice capable of withstanding temperatures down to -7°C . and a covering of snow have been found in Georgia and in Azerbaijan rices have been observed at altitudes of up to 2,100 m. So far sixteen varieties including forty sorts have been found. Some of these are naturally very early ripening.

Of *Phaseolus* eighty sorts are known in Georgia, displaying tremendous diversity in characters. In Armenia it grows up to 1,900 m. Gram (*Cicer arietinum*) also displays great diversity in Azerbaijan. It grows up to 1,600 m. and many forms are highly drought resistant.

Soya beans are of rather recent introduction.

Almost only the small-seeded lentils are found. The lentil is an ancient crop and apparently presents great racial diversity.

Peas, although cultivated only within very narrow limits, shew tremendous variety and a certain number of endemics.

The various forage plants are treated on similar lines.

367. PARKER, J. H. and PAINTER, R. H.

633-2.7-1.521.6:575

Insect resistance in crop plants.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 150-52. (Abst.)

A few instances in the literature of the resistance of plants to insect attack are briefly mentioned. At the Kansas Agricultural Experiment Station differences in resistance to injury by chinch bugs in corn, sorghums and grass species have been noticed. There are marked differences among sorghum varieties. The F_1 of sorghum crosses were all highly resistant and in a cross between the resistant Kaffir variety Kansas Orange and susceptible Milo, plants were observed that were more resistant than the Kaffir parent. It is thought that certain structural features of the stem may be of importance in determining resistance.

Over 400 varieties of wheat have been tested for their resistance to Hessian fly and could be grouped as highly resistant, moderately resistant and very susceptible.

Crosses between resistant and susceptible varieties have shewn the heritable nature of resistance which is probably determined by multiple factors.

Resistance is probably protoplasmic in nature and dependent on the composition of the cell sap. Evidence of physiological races of the Hessian fly has been obtained.

CEREALS 633.1

368. CHRISTIANSEN-WENIGER, F.

633.1(56)

Bericht über eine Studienreise durch das ostanatolische Hochland. (Report on a tour of investigation through the mountains of Eastern Anatolia.)

Z. Züchtung 1932 : A. 18 : 73-108.

The geological and climatic conditions of the district are described and its continental climate emphasized.

The varieties met with are the brown, hairy and the white, non-hairy types of *Triticum vulgare* and *T. compactum*. On the border-land between the eastern and central regions, *T. aegilopoides*, *durum*, *dicoccum*, *turgidum*, *monococcum* occurred.

T. durum is not considered as an indigenous species. Further, the uniformity of the wheat populations is pointed out : all the foreign forms introduced during the war, appear to have been eliminated by climatic conditions. This shews that the forms from central Anatolia can only exceptionally be successful in the eastern part.

As regards the ear-form, the *vulgare* type can be divided only into two groups : the *compactum* and lax-eared type. A close correlation was found between the length of the rachis and that of the rachis segments, and none between the length of the rachis and that of the culms. The results of these studies are given in graph form.

The varieties of rye occurring in the district are multiple, mostly characterized by brown glumes. Wild rye also occurred over large areas. The varieties of wild barley collected were of the two-rowed type and differ in size, the larger type being attacked by *Tilletia hordei*.

369. ARNOLD, L. E. and JENKINS, M. T. 633.1:575.12:575.22
The relative variability of corn crosses and varieties.
 J. Amer. Soc. Agron. 1932 : 24 : 868-71.

The authors present the results of an investigation on the amount of variability of varieties and three kinds of crosses : single crosses, inbred variety crosses and double crosses.

The varieties grown were all standard Iowa varieties. The crosses were made with Four County White as the staminate parent.

The minimum, mean and maximum coefficients of variability for five characters are recorded in a table. The varieties appear to be most variable, the single crosses least variable.

A more detailed study was made of the coefficients of variability for single crosses and inbred variety crosses.

The relative advantages and disadvantages of the uniformity of single crosses are pointed out.

370. KATTERMANN, G. 633.1:575.127.5:576.312.3
 Ein Beitrag zur Frage der Dualität der Bestandteile des Bastardkernes. (A
contribution to the duality of the elements of the hybrid nucleus.)
 Planta (Berl.) 1933 : 18 : 751-85.

The suggestion that the incompatibility of the nucleus of intergeneric crosses of cereals may manifest itself otherwise than in the non-pairing of the chromosomes, was first made by Bleier.

In the observations previously made by the author on pollen mother cells, the author agreed with Bleier in considering the cells with an abnormal nucleus to be due to cytomixis.

The author further investigated the F_1 and F_2 plants of wheat x rye crosses with regard to the origin of the abnormal cells.

The plant XS No. 1 is a backcross of the hybrid *Triticum vulgare* var. *ferrugineum* x *Secale cereale* with rye. Three pollen mother cells shewed, in the metaphase of the first reduction division, the presence of an excess of chromatin besides the normal set of chromosomes. Cells in the early diakinesis stage also contained secondary nuclei in addition to the main nucleus. In the zygonema and pachynema phases the cytomixis, i.e., the passage of nuclear material from one cell to another, was most obvious.

Similar phenomena were observed in plants XI S and IX S No. 1 which both originated from backcrossing the hybrids *T. vulgare* var. *erythrospermum* x *Secale cereale* with wheat. The F_1 and F_2 plants of various other crosses confirm the results above.

The causes of the occurrence of cytomixis are discussed and a critical review of the literature on cytomixis is given.

371. BERKNER, F. and SCHLIMM, W. 633.1:576.341
 Kritische Beiträge zur Frage der Saugkraftmessungen an unseren Getreidearten. (Critical notes on the question of the osmotic pressure determination of our cereals.)
 Landw. Jb. 1932 : 75 : 499-530.

The discrepancies between the different theories on the relation of the osmotic pressure in cereals to the external conditions and to yield, induced the authors to carry out further investigations. Pot and field experiments were carried out with various cereal varieties, the results of which shew that yield, earliness and resistance to drought increase, but the transpiration coefficients decrease with increase of the osmotic pressure.

Stress is laid on the distinction to be made between the osmotic pressure as a genotypic and as a phenotypic character. As the first is often hidden by the second, it can only be determined by investigating the greatest number possible of varieties of different origin.

372. O'KELLY, J. F. and HULL, W. W.
Parent-progeny correlations in corn.
 J. Amer. Soc. Agron. 1932 : 24 : 861-67.

633.1-1.557:519.241.1

The purpose of this study is mainly to shew the correlation between the yield of the mother plant and that of the progeny, and in the second place to determine the degree of inheritance of grain percentage.

The correlation studies were made by the plant-to-row method. Descriptions of the method and correlation coefficients are given. Those for yield with yield are small; the high-yielding parents thus have only a slight tendency to produce high-yielding progenies. Grain percentage with grain percentage was strongly correlated. Grain percentage with yield and yield with grain percentage again gave correlations of little significance.

The necessity of using other measures as criteria in selection is pointed out.

373. *JACUBZINER, M. M. 633.11(56.9)
(The wheats of Syria, Palestine and Transjordan cultivated and wild.)
 Suppl. 53 Bull. Appl. Bot. Leningrad 1932 : Pp. 276.

A full description of the wheats collected by the Soviet expedition to the above countries. The general conditions of cultivation are described. Wheat cultivation has been observed from 300 m. below to 2,000 m. above sea level. Clear regional distributions of the species were observed. In all 715 samples were examined, 47 from Transjordan, 489 from Palestine and 179 from Syria.

Only *T. durum* attains a wide cultivation and is remarkable owing to a whole series of characters unusual for this species, further illustrating the wide variation in the 28 chromosome wheats; types are found with rounded grain, of the *sphaerococcum* type, others in which the waxy layer on the vegetative organs is entirely absent, with pubescent seedlings, purple seedlings resembling the Abyssinian wheats, with pubescent leaf, leaf sheath and auricles, with ciliated leaf sheath, bent or awnlike empty glume tooth exceeding 5 mm., smooth or slightly scabrid awns, shedding awns and with hollow straw. Many of these forms, e.g., those with ciliated leaf sheath and those with smooth awns, are strictly endemic. The majority are dense forms but many belonging to the extreme lax group also occur.

Ecologically these wheats are characteristic in the extreme brevity of the spring period of development; this is one of the earliest groups of *durum* wheats known, the Arabian and Abyssinian groups being the only exception. Other valuable agronomic features are displayed in the strength of the straw, drought resistance, large size and yield of grain characteristic of some forms. Moreover the enclosure of the grain in the glumes is sufficiently tight to prevent shedding and yet not such as to interfere with ease of threshing.

On account of all these distinctive features the Syrian-Palestine *durums* are established as a distinct group of varieties. It is further suggested that the lax forms also constitute a group distinct from the dense forms.

There is a definite association of certain of these characteristic features, e.g., waxless and smooth chaff, curved glume tooth and pubescent leaves, although types cutting across these associations were observed occasionally.

The supposition that all *durum* wheats are disease resistant was disproved by these wheats, the majority of which proved to be markedly less resistant to brown and yellow rust than the common *durums*, although certain fully immune forms occurred. The samples of *T. polonicum*, *turgidum* and *dicoccoides* were equally susceptible and even *T. monococcum* was occasionally attacked. Attack by *Puccinia graminis* was less severe and immunity to *Fusarium* was found in some races. There is also indication of the presence of races resistant to Hessian Fly.

In addition to the *durum* wheats, characteristic features were observed also in some of the other species. *T. polonicum* repeats many of those mentioned for *T. durum*, including waxlessness. *T. vulgare* exhibits unusual forms with bristly pubescence on the stem and leaf sheath, others with glabrous leaf sheath, solid straw in as many as a quarter of the specimens found, rust resistance, purple seedlings, absence of wax in certain forms including awnless and *compactum* forms, a combination endemic for Palestine. Smooth awned forms appear in Syria in *T. turgidum* and, incidentally, also in barley. *T. turgidum* also has waxless forms and is characterized by

* A full summary of this work is on file at the Bureau.

smooth leaves, spring habit and flinty grain. *T. dicoccoides*, as already pointed out, is susceptible to fungous diseases and certain spring forms of it have been disclosed, these often being waxy; it is also characterized by purple seedlings covered with short, rough hairs; not, however, invariably by glabrous leaf sheath. Comparisons are made between this and the Armenian group of *dicoccoides*, which is in many respects indistinguishable from *T. monococcum*, as a result of which the two groups are separated into distinct subspecies.

Various non-typical forms of *T. dicoccoides* have previously been observed, some of which have a rachis which, though brittle, fails to articulate.

The wild einkorns are also somewhat different from those of Armenia, being amongst other things larger and having dentate keel and rough glumes.

Natural crossing between wild and cultivated wheat and also between wild emmer and *dicoccum* has repeatedly been observed. This, together with the products of hybridization obtained under controlled conditions, leads to the conclusion that many of the non-typical forms described have originated by hybridization and that many of the endemics are also the result of wide crosses. This leads to the anticipation of many valuable combinations arising by natural crossing, a point of much moment in consideration of the difficulties of artificial hybridization of *T. dicoccoides*. Many of the peculiar features of the *durums* under study are already reminiscent of *T. dicoccoides*. Hybridization work has already been begun with the object of introducing the desired characters of these wheats into the *durum* wheats of the Soviet Union. Genetical experiments so far have shewn the characters waxless and rigid straw to be dominant, brittle rachis behaves as either dominant or recessive.

374. CLARK, J. A. 633.11(73)

Registration of improved wheat varieties, VII.

J. Amer. Soc. Agron. 1932: 24: 975-78.

The three following varieties are described: Baldrock, Reg. No. 271, an awnless selection from a hybrid between Red Rock and some unknown variety. Its advantages consist in being smooth, winter-hardy, a good yielder with stiff straw and satisfactory flour quality; Yogo, Reg. No. 272, a cross between Minturki (6155) and Beloglina-Buffum (5546)—its superior characters are high yield, winterhardiness and bunt resistance; Quivera, Reg. No. 273, offspring of a hybrid between Prelude (female) and Kanred (male), its principal advantage being that it is from six to seven days earlier than Kanred.

375. 633.11:575(43)

OPITZ, K. 633.14:575(43)

Die deutsche Roggen-und Weizenzüchtung im Lichte vierzigjähriger Sortenprüfungen der D.L.G. (The German rye and wheat breeding in the light of the four-year variety tests of the D.L.G.)

Mitt. deuts. Landw.Ges. 1932: 47: 738-39.

Brief account of work reviewed in "Plant Breeding Abstracts," Vol. III, Abst. 187.

376. GAINES, E. F. 633.11:575.12:632.451.3-1.521.6:575.11

Reaction of a wheat cross to three physiologic forms of bunt.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 58-59. (Abst.)

An analysis of the resistance of the F_2 families in the cross White Odessa (susceptible to forms L4 and T2 but rather resistant to form T11) x Hohenheimer (very resistant to L4 and T2 but intermediate to T11) indicated a single factor for resistance to L4 and T2 and two factors for resistance to T11. The correlation coefficient for the reaction to L4 and T2 was 0.93 ± 0.01 for the reaction to T2 and T11 it was 0.42 ± 0.07 and for L4 and T11, 0.46 ± 0.06 .

377. 633.11:575.127.2

HEBRARD, J. 633.11:575(44)

Résultats des essais d'hybridation de blés effectués de 1923 à 1931 à l'Ecole Nationale d'Agriculture de Montpellier. (Results of hybridization experiments with wheat made from 1923-1931 at the École Nationale d'Agriculture de Montpellier.)

Ann. Ec. Agric. Montpellier 1932: 22: 13-44.

This paper represents the results of an attempt to improve four local varieties of soft wheats and one of hard wheat by crossing them with the varieties Vilmorin's Hâtif inversable and Ardito. The qualities chiefly considered for improvement were yield and resistance to lodging. Crosses were made in 1923, 1926 and 1929. A description is given of the F_1 and F_2 of each cross and of its reciprocal and in some cases of F_3 and F_4 .

There follows a further description of the promising lines selected, at least one of which approaches the desired type.

378. KANIEWSKI, K. 633.11:575.127.2:575.11
Crossing experiments on tetraploid species of wheat.
 Bull. Acad. Polon. Sci. et Lettres, Cracovie 1931 : 231-53.

Crosses were made between *Triticum polonicum* x *T. dicoccum* and a *polonicum*-like form x *T. durum*, a number of morphological characters of the ears and glumes being studied in the F_1 and F_2 generations.

The F_1 of both crosses was intermediate. Transgressive segregation was observed for several characters in F_2 . From the data, *T. polonicum* and the *polonicum*-like forms are regarded as the PP type and *T. dicoccum* and *T. durum* as pp. Symbols up to N are assigned to the various characters and their dominance and recessiveness indicated. Segregation ratios are not given.

379. *VAKAR, B. A. 633.11:575.127.2:576.356
(Cytological study of the interspecific hybrids of the genus *Triticum*.)
 Bull. Appl. Bot. Leningrad 1932 : Ser. 11 (1) : 189-241.

A rather detailed review is presented of the findings of various authors on the chromosome behaviour of the various types of interspecific wheat hybrids, including the present author's earlier paper on pentaploid hybrids of *T. persicum*. The parallelism of number and type of bivalents with degree of fertility is regarded as the most important outcome of these investigations. The methods employed in the present investigation of a large number of interspecific wheat hybrids and certain pure species are described, some of the crosses being here described cytologically for the first time.

T. persicum was examined and the reduction division shewed perfectly normal behaviour of fourteen pairs of chromosomes.

T. dicoccoides occasionally displayed certain irregularities in the reduction division, consisting mainly in the lagging of certain chromosomes, which does not however prevent their normal inclusion in the daughter cells, and the pollen was perfectly normal. Thus the low fertility of many hybrids involving this species cannot be ascribed to irregularities of division in the pure species.

T. dicoccum, in the form of a sample from Abyssinia, displayed almost complete regularity in the reduction division and pollen formation, never more than two lagging chromosomes being observed.

The pentaploid hybrids examined all displayed the same general characteristics, namely the presence of fourteen bivalent and seven univalent chromosomes at metaphase, the univalents being usually arranged around the bivalents. Anaphase usually discloses varying numbers of lagging univalents and some chromosomes are frequently eliminated from the spindle.

The univalents in some crosses divide after the bivalents, their halves passing later to the poles. In others they move at random to the poles without dividing, and in still others some behave in one and others in the other of these two ways.

As meiosis progresses conditions tend to right themselves and telophase and the formation of tetrads and pollen grains are frequently normal.

Amongst these pentaploid hybrids *T. turgidum* x *T. vulgare* and *T. sphaerococcum* x *T. pyramidale* stand out by being less irregular in meiosis than the rest, which possibly indicates a somewhat closer affinity between these pairs of species respectively.

The behaviour in the F_2 and F_3 was similar although somewhat less irregular.

* A full summary of the behaviour of the individual crosses is on file at the Bureau.

The various tetraploid hybrids examined were much more nearly normal, although irregularities of the same type appeared in some of them. In crosses of *T. durum* with *T. dicoccum* and *T. persicum* irregularities were almost absent, a certain amount of lagging being occasionally detectable. The hybrids were quite fertile. This suggests to the author the possibility of obtaining hybrids with the valuable grain properties of the *durum* parent combined with the adaptability to unfavourable growth conditions associated with *T. dicoccum* and *T. persicum*. Crosses of *T. dicoccoides* with *T. durum* and *T. persicum* were of interest in that although they displayed considerable irregularities of division, yet these were not of such an order as would account for the high degree of sterility of these hybrids.

Descriptions are given, with figures, for each of the crosses in turn.

380. 633.11:575.127.5:633.11 *Aegilops*:576.354.46
 KIHARA, H. and LILIENFELD, F. 633.11 *Aegilops*:575.127.2:576.354.46
 Genomanalyse bei *Triticum* und *Aegilops*, IV. Untersuchungen an *Aegilops*
x Triticum- und *Aegilops x Aegilops*-Bastarden. (Genom analysis in
Triticum and *Aegilops*, IV. Investigations on *Aegilops x Triticum* and
Aegilops x Aegilops hybrids.)
 Cytologia 1931/32 : 3 : 384-456.

The following crosses were investigated :

Ae. speltooides x T. monococcum and *Ae. Aucheri* ; *Ae. Aucheri x T. durum* ; *Ae. cylindrica x T. aegilopoides* ; *Ae. ovata x T. aegilopoides*, *T. vulgare*, *Ae. speltooides* and *Ae. cylindrica* ; *Ae. ventricosa* ssp. *comosa x T. aegilopoides* ; *Ae. ventricosa* ssp. *fragilis*, *Ae. cylindrica* and *Ae. ovata* ; *Ae. truncialis x Ae. cylindrica*, *Ae. ovata* and *Ae. ventricosa* ssp. *comosa* ; and *T. persicum x Ae. ovata*. In the hybrids of each cross the amount and extent of chromosome pairing was noted and from these preliminary results tentative conclusions are drawn as to the homology of the various genomes concerned.

In the first cross all the members of the S genom (common to *Ae. speltooides* and *Ae. Aucheri*) were able to pair with those of the A genom of *T. monococcum*, the combination 2-4 being most frequent. Trivalent and tetravalent associations also occurred. The hybrid was completely sterile.

In the cross *Ae. Aucheri x T. durum* the same genomes were involved and in addition B from the wheat parent. There were 2-8 bivalents, the most frequent number being 6-7. There were also tri- and tetravalents. It is assumed that S, which is probably phylogenetically the oldest genom, combines equally readily with A and B.

From the crosses between *T. aegilopoides* and the three species of *Aegilops*, *cylindrica*, *ovata* and *ventricosa*, it appears that the A genom of the wheat is not homologous with the C genom present in the three species of *Aegilops* and that *Ae. ovata* cannot be an autotetraploid as Aase has assumed.

The cross *T. persicum x Ae. ovata* represents the genomes AB + C and E. 0-3 bivalents were observed but mostly 0.

In *Ae. ovata x T. vulgare* the genomes concerned were C, E + AB and C. 0-5 bivalents occur, one being the most frequent.

The main result that emerges from the series of crosses between *Aegilops* species is that the C genom in the four species concerned, *truncialis*, *ovata*, *ventricosa* and *cylindrica* is not strictly homologous but has undergone a certain amount of modification in each case.

The bearing of these results on the phylogeny of the various species is discussed together with the means by which the differences among the species may have arisen.

381. BONNE, C. 633.11:575.2:519
 Variationsstatistische Weizenversuche : Weitere Ergebnisse aus dem ständigen
 Variationsversuch mit Strube's Dickkopf-Winterweizen. (Statistical experi-
 ments on variation in wheat : further results of experiments on the
 variation of Strube's Dickkopf winter wheat.)
 Z. Züchtung 1932 : A. 18 : 53-72.

The variants as regards habit, weight of grain, length of stalks and density of the ears of Strube's Dickkopf 3333 were selected and 2-3 of each variant were grown.

The factor "short stalk" appeared to be correlated with the factor "low weight of grain." The coefficient of variation was influenced by weather conditions. The extreme variants grew true to type and can be considered as genotypes. There is evidence that factor mutations continuously occur in self-fertilized plants.

382. DUMON, A. G. 633.11:575.242
 Speltoïden en compactoïden bij rassen van *Triticum vulgare*. (Speltoids and compactoids in races of *Triticum vulgare*.)
 Natuurwetenschappelijk T. 1931 : 13 : 101-04.

An awned speltoid, differing from those observed by Nilsson-Ehle and others, appeared in 1926 in Strube's Dickkopf, unawned. In 1927 it segregated into forty-eight awned speltoids and two semi-awned (1-1.5 cm.). The former group bred true and the others again segregated into six homozygous awned speltoids, sixteen heterozygous semi-awned and six unawned—i.e. 1 : 2 : 1. The last group was homozygous for awnless but some segregated for other characters. In addition, four compactoids have appeared directly in the progeny of pure-line normal plants. The first of these gave twenty-five normal : one almost normal : one *compactum* : two super-*compactum* in the F_2 . The first and fourth groups bred true, the almost normal plant segregated into five normal, one four-cornered, five *compactum*, one long and lax eared plant and two super-*compactums*. The *compactum* plant also segregated, giving five normals, six *compactums* and one super-*compactum*. All these normal segregates bred true, as did also the super-*compactums*. The *compactums* segregated further.

The long and lax plant gave seven short-strawed plants with well-developed dense ears and seven with long lax ears. The combination of this short straw with well-developed grain would be a very desirable one from the breeding point of view and crosses are being made with this end in view. The other three *compactums* are under investigation and the cytology of the whole material is in progress.

383. HÅKANSSON, A. 633.11:575.242:576.354.4
 Zytologische Studien an compactoiden Typen von *Triticum vulgare*. (Cytological studies on compactoid types of *T. vulgare*.)
 Hereditas 1933 : 17 : 155-96.

A brief account is given of the occurrence of the compactoid types and the theories advanced in explanation.

They usually occur as segregates among the B series of speltoids, are heterozygous and known as *subcompactum*. They segregate into normal plants, *subcompactum*; heterozygous speltoids and short *compactum* types. Among the latter a very short form can be distinguished known as the dwarf *compactum*. This is not the homozygous form but segregates further into normal, *subcompactum* and short *compactum*. Speltoid heterozygotes appear in the next generation of *subcompactum*.

A cytological investigation of meiosis in the pollen mother cells was made on a number of these *subcompactum* types and their derivatives from various sources.

Forty-two chromosomes were usually found in the *subcompactum* plants but one pair differed from each other and from the rest and frequently behaved as univalents. These are distinguished as the no- and co-chromosomes. The distribution among the gametes was (20 + co) and (20 + no) or (20 + no + co) and (20). The speltoid segregates had twenty bivalents + a univalent identified as the no-chromosome. A dwarf *compactum* has 20 + co + co and the formula for the normal plants is assumed to be 20 + no + no.

It is suggested that the no-chromosome represents the C chromosome as the formula for speltoids given by Winge and Huskins is $\frac{ABC}{AB}$ and the co-chromosome also is the C chromosome which has undergone a change.

Among the *subcompactum* plants received from Åkerman and which were segregates from C or A type speltoids, some trisomic types were observed with forty-three chromosomes (20II + 1III). The trivalent was probably formed by three C chromosomes. Other types were also studied in some detail.

384. POWERS, L. 633.11:576.356

Cytological aberrations in *Triticum*.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 160-61. (Abst.)

This is a continuation of the work reviewed in "Plant Breeding Abstracts," Vol. III, Absts. 49 and 50. Further statistical data are given of the correlations between non-orientation, non-conjunction and micronuclei.

More evidence was found for the assumption that there is association between polyvalence and micronuclei.

The number of micronuclei may be taken as a general measure of germinal instability. The examination of 500 microspores would, it is believed, provide data of sufficient accuracy for the determination of the number of micronuclei.

385. STEWART, G. 633.11:581.46:575.11.061

Re-assembling the factors for awns and for spike density in Sevier x Federation wheat crosses and back crosses.

J. Amer. Soc. Agron. 1932 : 24 : 843-61.

The cross between the above varieties, already studied in 1925, was repeated in order to verify the conclusions on the inheritance of awn and spike characters.

By crossing the more dense Sevier x the more lax Federation, transgressive segregation was found as previously in spike density : although neither parent is *T. compactum*, yet 25 per cent of the progeny were *compactum* types ; other progenies on the contrary were laxer than the lax parent.

As regards awn behaviour, four true-breeding classes were found by crossing the awnless Federation x the awned Sevier : two classes were like each parent and were designated 1 and 4 respectively and the two others intermediate and called 2 and 3.

These latter classes were thought in the previous study to be based on a two-factor difference, one factor having been acquired from either parent. To test this, a cross of the two intermediate forms was made ; in the F_3 progenies obtained, the grandparental types were restored, however no sign of linkage was found. The study of the two back-crosses of each of the intermediates with the awnless parent proved the existence of a one-factor difference between the intermediates. The back-crosses also shewed the awn class 1 to be different from the awn class 2 and thus confirm the correctness of the four awn classes established in 1925.

Some evidence was found that the awnless type is recessive.

386. MUDRA, A. 633.11-2.111:581.1

Zur Physiologie der Kälteresistenz des Winterweizens. (On the physiology of cold resistance in winter wheat.)

Planta (Berl.) 1932 : 18 : 435-78.

As cold resistance in wheat is the result of a number of factors, it may be assumed that these control a number of different physiological processes, some of which are analyzed in this investigation.

The two most important are the decrease in hydration by loss of water and the accumulation of soluble carbohydrates. Other factors such as an increase in non-reducing sugar and the proportion of food materials, and many others, play a part.

All degrees from complete resistance to complete susceptibility to cold may occur depending on the genetical constitution of the plant concerned and numerous tests and different methods are necessary to determine the degree of resistance present in a variety. It is also important for breeding to know which combination to select.

387. MCFADDEN, E. S. 633.11-2.112:632.452-1.521.6:581.49

An apparently inseparable association of one type of rust resistance with a peculiar susceptibility to heat injury in wheat.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 129-30. (Abst.)

Three distinct types of resistance of the wheat plant to stem rust are recognized : (1) in which subepidermal or very small, isolated external pustules are formed, due, it is thought, to the

morphological structure of the host ; (2) the appearance of necrotic flecks without pustules which is believed to be due to a physiological reaction ; (3) in which pustule formation is delayed and the nature of the resistance is unknown and (4) known as the " Hope " type, first noticed in Hope wheat in which neither flecks nor pustules appear. There are indications that the slow opening of the stomata in sunlight is responsible for this resistance.

Associated always with the Hope type of resistance is a marked susceptibility to injury by heat and drought, due, it is suggested, also to the slow response of the stomata to stimuli causing opening and closing. This is not, therefore, a case of linkage but probably different expressions of the same character.

388. BRIGGS, F. N. 633.11-2.451.3-1.521.6:575.11

The inheritance of resistance to bunt in wheat hybrids.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 14-16. (Abst.)

Classification was in every case made on the F_3 families. The cross Martin x White Federation shewed that Martin contains one main dominant factor for resistance and crosses of White Federation also with White Odessa, Banner Berkeley and Odessa shewed each of these to possess a similar resistance factor: That the factor was the same in all cases was shewn by crosses of Martin with the other three.

That Hussar also contains the Martin factor was proved by crosses between them but from the cross a line was isolated which possessed a second resistance factor, incompletely dominant to susceptibility ; this was designated H. and clearly was contributed by the Hussar parent.

Further crosses of White Federation with Turkey 1558 and Turkey 3055 have shewn these to contain a factor similar to and probably identical with the H. factor.

By crossing with Martin followed by repeated backcrosses to the commercial varieties, resistance has been introduced into many of these whilst retaining their other characteristics.

389. HAYES, H. K. 633.11-2.452-1.521.6:575.11

The genetics of stem rust resistance in wheat.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 81-83. (Abst.)

An outline is given of the present position of the problem of breeding for resistance to stem rust. The difficulties were much increased by the discovery of more than 100 physiological forms. Resistance to one or several forms might be dependent on a single factor or there might be resistance to one form linked with susceptibility to another. The recent discovery of mature plant resistance and the fact that in this type resistance to all physiological forms might depend on one or two factors has greatly simplified the problem.

390. HUBERT, K. 633.11-2.452-1.521.6:575.11

Beiträge zur Züchtung rostresistenter Weizen. (Contribution to breeding wheat resistant to rust.)

Z. Züchtung 1932 : A 18 : 19-52.

In continuation of the work done by Rudolf and Isenbeck, the author made a series of crosses in order to combine the resistance to *Puccinia glumarum tritici* and *P. triticina* possessed by varieties otherwise of little value for breeding, with the high properties of cultivated varieties. As *P. glumarum tritici* appears to consist of different physiological races, the origin of the material used for infection was always determined.

The method of infection in the greenhouse was the same as that applied by the previous workers. The effect of temperature on the degree of infection is emphasized.

Crosses of winter varieties were made as follows: the immune variety Chinese 166 x susceptible variety Ackermann's Bayernkönig and the highly resistant Chinese 165 x Ackermann's Bayernkönig. The results confirm the dominance of resistance to *P. glumarum tritici*.

The results obtained with spring varieties were quite different ; in crosses of the highly resistant Blausamtiger Kolben, Normandie, Saumur x susceptible Peragis and Quax resistance of spring varieties to *P. glumarum tritici* proved to be dependent upon a single recessive factor.

Further, as shewn by the F_2 generations, the number of intermediate types formed in crosses

of spring wheat is smaller than that in crosses of the "Chinese" races. This is also confirmed by the F_3 generation. In order to determine the resistance to *P. tritici* race 15, crosses of Blausamtiger Kolben x susceptible Peragis, and of Normandie x Peragis were made; results are presented which shew that resistance is dominant and dependent upon a single factor.

Attempts were made to obtain hybrids resistant both to *P. glumarum tritici* and *P. tritici*. This desideratum was fulfilled by certain individuals of the F_3 progeny of Blausamtiger Kolben x Peragis.

For the purpose of breeding, the most desirable material was chosen for further cultivation. It remained resistant through 4-5 generations.

391. PELSSENKE, P. 633.11:664.641.016:575.11
Beiträge zur Qualitätszüchtung des Weizens. (Contributions to the
breeding of wheat for quality.)
Z. Züchtung 1932: A 18: 1-18.

The quality of the gluten is one of the most important factors in the determination of baking quality. Previous investigations have proved its heritable nature and the present work represents a further contribution to the subject.

Altogether 2863 strains from 124 crosses of spring and winter wheats were investigated. The gluten quality was tested by the fermentation method of the author. The strains used could be grouped into three distinct classes. A, wheats with high quality gluten and a test number 60. B, wheats of good baking quality but not up to A with a test number 30-60. C, wheats needing the addition of the A group to produce a flour of good baking quality, test number under 30. Crosses were made between wheats of the various groups. The progeny of the crosses of A and B with C gave a preponderance of low quality wheats. In crosses between B x B and C x C better quality wheats than the parents might be obtained from the progeny of the C x C crosses and wheats of weaker quality from those of B x B. Taken as a whole the results suggest that good gluten quality is a recessive character determined by a number of factors.

It has proved possible to combine gluten quality with such other desirable qualities as resistance to rust and lodging.

The number of qualitatively valuable strains is the less the lower the test number of the parents. Among the spring wheats there appeared to be a correlation between earliness on the one hand and vitreousness and protein content on the other.

392. CARON-ELDINGEN. 633.11:664.641.016:581.01
Gedanken und Erfahrungen eines Weizenzüchters über den Einfluss der Sorte
und der Wachstumsbedingungen auf die Backfähigkeit des Weizens.
(Thoughts and experiences of a wheat breeder on the influence of
variety and growth conditions on the baking quality of wheat.)
Deuts. landw. Pr. 1932: 59: 117-18.

The author recommends growing the seed for one year in the experiment station before making tests of new varieties, and also in following years to use seed from the plants growing on the experiment station. This process of acclimatization is said to improve the growth of the crop. Stress is laid on the fact that high quality and yield can be combined and this combination should be the aim of the breeder.

393. 633.11:Aegilops:576.312.32:576.16
SENJANINOVA-KORCZAGINA, M. 633.11:576.16
(Karyo-systematical investigation of the genus *Aegilops* L.)
Bull. Appl. Bot. Leningrad 1932: Ser. 11 (1): 1-90.

An indication is given of the state of confusion in which the classification of the genus *Aegilops*. Studies of the polyploidy within the genus have shed no light on this confusion. The new methods of Levitsky, however, have enabled the authoress to observe clear morphological differences between the chromosomes. The characteristics of the chromosomes of a large number of species are given in the present work. Systematically closely related species shewed

great similarity in karyotype, so much so that certain species were on these grounds regarded as identical. Other species, whose systematic relationships have been confused, have shewn clear differences in karyotype, which on a closer examination have been confirmed by morphological differences.

The relationships between the species are discussed at length. Half the chromosome set of *Ae. cylindrica* is shewn to resemble *Ae. caudata*, the others resemble *Ae. bicornis*. These two species occur together at the centre of the *Aegilops* area and the possibility of this parentage of *Ae. cylindrica* agrees with the morphological characteristics of the three species. On similar grounds *Ae. persica* is thought to be an amphidiploid hybrid of *Ae. caudata* and *Ae. umbellulata*. *Ae. caudata* in turn is thought to have evolved, by reduction in length of chromosomes and increased dissection, from *Ae. comosa*, with which it is compared. On karyological grounds, therefore, *Ae. caudata*, *Ae. persica* and *Ae. cylindrica* are united in the section *Cylindropyrum* as has been done by certain earlier systematists. The morphological and karyotypical characteristics of the section are outlined. Through *Ae. persica* this section is related to the section *Polyeides* and through *Ae. caudata* with the section *Comopyrum*, both with seven as the haploid number. The characteristic features of the latter are given, one of which is the absence of chromosomes with heads or appendages.

Amongst the hexaploid species, *Ae. crassa* has chromosome sets resembling both *Ae. bicornis* and *Ae. squarrosa* and at the same time displays morphological features characteristic of these two species. Geographically these three species are also united. The hexaploid species *Ae. turcomanica* shewed a karyotype of an entirely different type, seven of the twenty-one chromosomes displaying a close resemblance to those of *Ae. umbellulata*, with which it is proposed to unite it in the section *Polyeides*. The section *Polyplodes* Zhuk. is thus destroyed, *Ae. crassa* being combined with *Ae. squarrosa* in the section *Vertebrata*. *Ae. ventricosa* is of doubtful relationship but is distinct in karyotype from *Ae. crassa*, from which it is separated.

A parallelism is traced of the differentiation of the karyotype from the long equal armed type to the unequal and dissected type with the change from one to many-awned glumes; this relationship holds in general for the polyploid species too, although these being of hybrid origin are more variable. Parallel with this goes a change from long ears with appressed spikelets to oval, spreading types. Both karyological and morphological characters indicate the polyphyletic origin of the *Aegilops* species.

Triticum aegilopoides was examined by the same methods and revealed an entire absence of dissected or unequal-limbed chromosomes. The current views on the origin of *T. vulgare* are summarized. On the basis of the present observations it is emphasized that if *T. vulgare* contains one set of chromosomes from *Ae. cylindrica* it is highly improbable that it contains any from *Ae. ovata* and vice versa.

Preparations were made from *T. vulgare* by the same method but were unsuccessful; only by considerably altering the fixative were accurate observations possible. No chromosomes with the characteristics of *Ae. cylindrica* were observed, neither the types with appendages derived from *Ae. caudata* nor the triarticulate type derived from *Ae. bicornis*. The presence of *Aegilops* chromosomes in *T. vulgare* is therefore regarded as highly improbable and emphasis is laid on the unreliability of chromosome conjugation as a criterion of homology.

394. 633.13 Grignonaise

SCHRIBAUX and CREPIN, C.

633.13-2.183-1.521.6:575

Une avoine nouvelle à grain gris : la Grignonaise. (A new oat with grey grains : la Grignonaise.)

C. R. Acad. Agric. Fr. 1933 : 19 : 128-30.

The old variety Houdan was crossed with Ligowo-Brie in order to combine the fine grey grain of the first with the rigid straw of the second.

Among the progeny one individual was chosen for further cultivation and was called Grignonaise. It has a grain hardly coarser than that of Houdan and a straw rigid enough for cultivation on rich soils. Its productivity exceeds that of Houdan by one quarter and is thus comparable with that of von Lochow.

395. EMME, E. K. 633.13:575.127.2:576.356

(Investigation of pentaploid oat hybrids I.)

Bull. Appl. Bot. Leningrad 1932: Ser. 11 (1): 169-76.

The Abyssinian cultivated oat, *Avena abyssinica*, closely resemble *A. sativa* although it differs in chromosome number, having the diploid number 28—i.e. tetraploid.

According to N.I. Vavilov, *A. sativa* is entirely absent in Abyssinia although *A. fatua* is present. Crosses were made of *A. abyssinica* and *A. barbata* Pott. by *A. diffusa* male.

The pentaploid hybrids were all absolutely sterile. In the three cases examined the somatic number of the hybrids was thirty-five. In the reduction division no more than seven—eight bivalents were usually observed.

The bivalents were much longer than the univalents and lay in the central part of the spindle, moving before the univalents to the poles.

In spite of the great difference between the two tetraploid species used as female parent, the behaviour of both hybrids was nearly identical. Certain differences between the behaviour of these and hybrids examined by Dorsey are indicated.

These crosses give a further support to the view that the two tetraploid species in question are systematically far removed from *A. diffusa*.

According to a footnote certain fertile pentaploid hybrids have now been obtained.

396. 633.13:575.242

COFFMAN, F. A. and TAYLOR, J. W.

633.13:581.162.32

Prevalence and origin of fatuoids in Fulghum oats.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 28-29. (Abst.)

Fatuoids appeared quite suddenly, in about 0.2 per cent of the plants, after four years continuous selfing. They all appeared as heterozygotes and apparently arose by mutation. The fatuoids were comparatively sterile and when left to open pollination as much as seven per cent of crossing with the cultivated form occurred. No aberrant forms arose on selfing the fatuoids.

Apparent cases of pollination of cultivated oats by *A. fatua* were observed.

397. EMME, E. K. 633.13:576.312.32

(Karyosystematic study of the oats of the section *Euavena* Griseb.)

Bull. Appl. Bot. Leningrad 1932: Ser. 11 (1): 147-68.

A brief outline is first given of the systematics of the section, in which is included a passing reference to a personal communication by N. I. Vavilov to the effect that "the common *A. barbata* Pott. bears no direct relationship to *A. strigosa* (sensu stricto)," constituting, rather, a distinct group in conjunction with *A. Wiestii*. Vavilov places *A. hirtula*, *A. brevis* and *A. nudibrevis* in another group and *A. sterilis*, *A. byzantina* and *A. Ludoviciana* in a third, closely allied to the fourth consisting of *A. sativa* and *A. fatua*. Somewhat apart are *A. abyssinica* and *A. Vaviloviana*, which in all but chromosome number most nearly approach *A. sativa*.

This grouping is also the only acceptable one from a cytological point of view. A historical review of cytological studies on oats is given.

The present authoress has examined a number of species and varieties and their chromosome numbers are tabulated. The investigation was carried out on the most varied and absolutely pure-line material, obtained from many different parts of the world. The Spanish oats ascribed by Malzew to *A. hirtula* proved to have fourteen diploid chromosomes, those which he ascribed to *A. barbata* Pott. had twenty-eight; this is a further proof of the collective nature of the old species *A. strigosa* Schreb. (sensu ampl.). Cultivated forms of the twenty-eight chromosome species *A. barbata* Pott. are unknown, the fourteen chromosome *A. hirtula* is allied to *A. strigosa* Schreb (sensu stricto), *A. brevis* and *A. nudibrevis* (articulations of the base of the first and second floret).

All the western European group (British Isles and Iberian peninsula) are characterized by fourteen diploid chromosomes and are morphologically similar; this justifies the separation of the typical *A. barbata* from *A. strigosa*, which together with *A. hirtula*, *A. brevis* and *A. nudibrevis* constitute a clearly demarked group.

All forms of the two Abyssinian species had twenty-eight chromosomes. In *A. Vaviloviana* all types occur varying from typical wild oats to forms closely bordering on the cultivated *A.*

abyssinica, and thus within these two the whole range of types is found in oats with the same chromosome number.

A study of the morphology of the somatic chromosome was made using Levitsky's method. Clear differences were observed between the different chromosomes in the fourteen chromosome species. In *A. strigosa* Schreb. (*sensu stricto*) there were two chromosome pairs with unequal limbs, in *A. brevis* four and in the one form of *A. nudibrevis* examined, the chromosomes with equal limbs predominated. Thus *A. brevis* stands somewhat apart from the other two. *A. strigosa* has appeared in crosses between *A. brevis* and *A. nudibrevis* and moreover one of its variants has been obtained in crosses of another of its variants with *A. brevis*.

It is thus evident that the three genotypes are very closely allied and the chromosomal differences may not be of any great significance.

In the tetraploid groups, *A. abyssinica* shewed three pairs of unequal-limbed chromosomes, *A. Vaviloviana* five, *A. barbata* six-seven. There is no evidence of the origin of any of the polyploid chromosome sets by duplication of the sets of any of the existing haploid species. This, as the authoress points out, in no way proves that these species have not arisen by duplication.

A few hexaploid species were also examined, leading to conclusions similar to those regarding the tetraploid species.

398. STANTON, T. R. 633.13-2.451.2

Navarro oats. 633.13 Navarro

J. Amer. Soc. Agron. 1933 : 25 : 108-12.

This is a new variety which attracts interest because of its high resistance to *Ustilago*. Its exact origin is unknown. Detailed characteristics of the oat are given which make it probable that it belongs to *Avena byzantina*. The yields of grain, however, were rather low.

399. REED, G. M. 633.13-2.451.2-1.521.6:575.11

Inheritance of resistance to loose and covered smuts in hybrids between certain susceptible oat varieties and Black Mesdag.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 164-65. (Abst.)

Crosses were made between Black Mesdag which is completely resistant to the physiological races of both kinds of smuts used and the varieties Hull-less, Silvermine and Early Champion, which may be up to 100 per cent susceptible. The F_2 plants were inoculated with loose and covered smut and the percentages of infected plants are given.

The F_3 plants were grouped as resistant (no plants infected), segregating (percentages of infection less than 50 per cent), susceptible (more than 50 per cent infected) and plants with a dissimilar reaction to the two smuts.

F_3 progenies grown from uninoculated F_2 plants segregated into resistant, segregating and susceptible in a 1 : 2 : 1 ratio. Of F_3 plants from F_2 plants inoculated with *Ustilago Avenae* one-third were resistant and two-thirds segregating.

A similar result was obtained for F_3 plants grown from F_2 plants inoculated with *Ustilago levis*.

400. ALLEN, R. F. 633.13-2.452:575.12:576.3

A cytological study of heterothallism in *Puccinia coronata*.

J. Agric. Res. 1932 : 45 : 513-41.

A detailed study of the development of the fungus on *Rhamnus cathartica* from which evidence for heterothallism is presented.

401. MUNTEANU, A. and DRĂGOESCU, V. C. 633.13:633.00.14(49.8)

Rezultatele culturilor comparative cu soiuri de ovăz. (The results of comparative tests with different lines of oats.)

Anal. Inst. Cercetări Agron. României (Ann. Inst. Recherches Agron. Roumanie) 1932 : 4 : 35-94.

Tests were made with seven varieties of oats on four different types of soil.

"Cenad 88" a selection by the "Sămănta" Society of Cenad proved superior by reason of its resistance to lodging and diseases, its earliness, high yield and quality.

402. **BENSIN, B. M.** 633.14 *S. turkestanicum*.
Turkestan autogamous rye. 633.14:581.162.31
 Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: p. 8. (Abst.)
Autogamous Turkestan rye.
 Bull. Torrey Bot. Cl. 1933: 60: 155-60.

The new autogamous species is said to have arisen as a weed in wheat, which it is gradually replacing. The new species is designated *Secale turkestanicum* Bensin and is furnished with a latin diagnosis, together with a description of the main characters. Self-fertilization is obligatory on account of the failure of the glumes to open at the time of pollination. This same character leads to the enclosure of the ripe grains by the glumes. This, together with the other typical features, is associated with the xerophytic nature of the plant. A further characteristic is the possession of three flowers in every spikelet.

The species is regarded as more primitive than *S. cereale*. It is strictly endemic to the region in question.

403. **KOSTOFF, D.** 633.14:575.127.2:581.162.5
Pollen abortion in species hybrids.
 Cytologia 1931/32: 3: 337-39.

The F_1 plants of the cross *Secale cereale* x *S. montanum* have about 75 per cent abortive pollen. Three plants of the back-cross x *S. cereale* had 15—20 per cent abortive pollen. The cytological characteristics of abortive pollen as against viable pollen are given. As also shewn by the investigation of *Nicotiana* species hybrids, which mostly have abortive pollen, the abortion of pollen appears to be due to a retardation of the nuclear division at the moment of the opening of the anther. An explanation of this retardation is suggested.

404. **DUMON, A. G.** 633.14:575.14
 Genetisch onderzoek bij rogge (*Secale cereale* L.) [Genetical researches on
 rye (*Secale cereale* L.).]
 Meded. Sta. Plantenvered. Héverlée-Leuven 1932: No. 5: Pp. 19.

The methods of carrying out the ordinary work of individual mother plant selection at the Héverlée breeding station are briefly outlined.

Observations on continued inbreeding have shewn a marked deterioration in earliness and vigour, in spite of repeated selection for these points. Grain production was also markedly reduced, as well as the germinating power of the grains.

The percentage of seed set by self-pollination varied somewhat for different plants, these differences being apparently hereditary. About 70 per cent were quite sterile, the others set from 20 to 80 per cent. Out of the 240 ears tested no fully self-fertile individual was found. Some deteriorated in the first, others not till the second year of inbreeding. Most plants got steadily worse whilst others after a certain number of years reached a minimum. No plant without any ill effect was observed. A variety of aberrant types segregated.

In spite of constant selection for green grain, which gives better quality product, and absence of yellow grained plants in the fields, yellow grains constantly appeared in the inbred progeny. The extreme difficulty in recognition and the variability of this character are duly emphasized. However, pure yellow grains were obtained which also gave green seedlings, whereas seedlings from green grains (and also some yellow) were red; in such plants various other organs were also pigmented. All the characteristics of the green type were dominant in the F_1 of crosses with the unpigmented yellow and 3:1 ratios of the two types occurred in F_2 . This is thus a pleiotropic factor.

Yellow grained plants pollinated with pollen of green develop green grains, since the green colour comes from the aleurone layer and xenia thus occurs. By bagging these plants with other green plants, however, yellow grains will be produced in the second generation and this affords a means of testing the homozygosity of parent lines and so breeding pure green strains.

Two plants with brittle straw also appeared, the character being recessive; similarly plants which failed to ripen, chlorophyll deficient seedlings and plants with brown tips. Two aberrant plants which failed to ripen and whose lower internodes emerged from the sheaths in zig-zag fashion were ascribed to mutation; the character was also recessive.

405. KULESHOV, N. N. 633.15:016

(Forgotten pages in the literature on corn.)

Bull. Appl. Bot. Leningrad 1932: Ser. A (3): 157-60.

Reference is made to certain old French monographs on maize. Parmentier, writing in 1784, knew only the flint type. Reference is made in one of them to one Pierre Martyr who in 1493 referred to maize as a plant cultivated by the inhabitants of Haiti, St. Domingo, etc.

406. HACKBARTH, J. 633.15:575

Zur Genetik von *Zea mays*. (The genetics of *Zea mays*.)

Züchter 1932: 4: 290-302.

A general account of the facts already known as to the possible origin of maize, its chromosome number, number of factors identified and their distribution among the ten chromosomes. The bibliography contains 114 titles.

407. MCCLINTOCK, B. 633.15:575.061.633:576.356.2

A correlation of ring-shaped chromosomes with variegation in *Zea*

mays.

Proc. Nat. Acad. Sci. Wash. 1932: 18: 677-81.

One of the eight variegated plants examined was from untreated material the rest were from the progeny of x-rayed pollen.

The variegation was found to be definitely associated with the decrease in size of a ring-shaped chromosome involving the loss of a gene in the cells concerned or even with the elimination of the whole ring.

Increase in size and number of rings was also observed, but had no direct connexion with variegation.

408. SUCCI, A. 633.15:575-181.13:575"793"

Criteri selettivi del mais nano precoce. (Selective criteria of the early dwarf maize.)

Ital. Agric. 1932: 69: 951-55.

The apparent disadvantages of earliness and dwarfness associated in this type of maize may be of practical value under certain conditions.

Plants should be selected in which the length but not the number of the internodes is shortened and for preference those in which the dwarfness is most marked in the less important lower half of the stem. Dwarf plants are also compensated by a relatively greater vegetative development than the large varieties.

Earliness, by limiting the time for vegetative development may also limit production, but this is less marked when precocity is associated with the period of ripening and not with the period leading to flowering.

The dwarf maize has been quite extensively grown, not only in Italy, but in parts of Spain and France where its earliness is adapted to the shorter season and poorer soils.

The possibility of closer spacing also makes up in part for a diminished productivity.

409. SINGLETON, W. R. 633.15:575.114:575.113.7

Complete elimination of certain classes of gametes in *Zea*.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 182-84. (Abst.)

No s_a kernels were produced in ears of maize heterozygous for $S_a s_a$ and pollinated with s_a pollen. Selfed ears were found with as much as 88 per cent s_a kernels, the "high sugary" condition. In the first case there was complete elimination of the s_a female gametes and in the second a partial elimination of male and female S_a gametes due to the action of gametic lethal or semi-lethal factors.

The plants heterozygous for high sugary have pollen grains of two sizes, small and normal, the small grains representing the recessive v_a gene and closely linked with S_a . As the small pollen grains are unable to compete with the large grains the kernels are almost completely s_a .

Linkage of the V_{av} gene has been found with T_{at} 33.6 per cent ; $D_{e16}d_{e16}$ 5—6 per cent and $T_{e5}t_{e5}$ 13.0 per cent.

The va gene also causes abortion of some of the ovules.

Plants were found which were segregating for high sugary and low sugary at the same time, the high sugary affecting the pollen and the low sugary the ovules.

The symbol l_0 has been given to the "lethal ovule" gene for low sugary, which is inherited almost entirely through the pollen, in contrast to V_{av} which is inherited almost entirely through the ovules.

There is linkage between the l_0 gene and s_a with a cross-over percentage of about 2 per cent. No obvious irregularities were observed during a cytological examination of the reduction division of V_{av} plants.

410. HAYES, H. K. 633.15:575.116.1
Linkage relations between dominant white endosperm and glossy seedling, gl_1 , in maize.

Amer. Nat. 1933 : 67 : p. 75. (Abst.)

In crosses of dominant white of the constitution $Wh\ Wh\ YY$ with colourless $yy\ gl_1\ gl_1$, a creamy endosperm was produced, with segregation in F_2 , shewing a possible linkage between Wh and gl_1 . An F_1 of ($Wh\ Wh\ YY\ Gl_1\ Gl_1$) by the triple recessive crossed with $YY\ gl_1\ gl_1$ gave similar results. Out of 1,359 seedlings, 525 new combinations were obtained, shewing a cross-over percentage of 38.6 ± 0.9

411. BURNHAM, C. R. and BRINK, R. A. 633.15:575.116.1:581.45
Linkage relations of a second midrib gene (bm_2) in maize.
 J. Amer. Soc. Agron. 1932 : 24 : 960-63.

A brown midrib character found in the first generation of selfing the Golden Glow variety is described. On the basis of back-cross tests which gave a higher cross-over value with f , of studies with semi-sterile-1, -3 and -5, which gave about 35 per cent of crossing-over in each case and all involve the P-br chromosome, bm_2 appears to be located in the P-br linkage group. Trisomic tests with bm_2 confirm this, while direct genetic tests with other factors in this chromosome indicate that the linkage relations are P-br-f-an-gs- bm_2 . The location of bm_2 in this chromosome at a point remote from P and f greatly extends the map of this chromosome.

412. RHOADES, M. M. 633.15:575.116.12
Double crossing over in *Zea mays*.
 Amer. Nat. 1933 : 67 : 65-66. (Abst.)

Pr V_2

Trisomic plants of the constitution Pr V_2 were pollinated by the disomic double recessive and pr v_2

the progeny contained twenty-one trisomic individuals homozygous for pr, sixty-two for v_2 and some for both. The occurrence of these types shews that crossing-over took place when each chromosome consisted of two chromatids and their proportions suggest that v_2 is about three times as far from the insertion region as pr. The two loci seem to be on opposite sides of the insertion region.

413. EYSTER, H. 633.15:575.116.4
Linkage studies in maize.
 Amer. Nat. 1933 : 67 : p. 75. (Abst.)

The arrangement of genes, including certain new ones, in chromosomes IX and V is given.

414. PARK, J. B., ANDERSON, A. and MEYERS, M. T. 633.15:575.12
Variability of sweet corn hybrids as affected by genetic constitution.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 148-50. (Abst.)

The variability was calculated for the following types of hybrids : single crosses between lines inbred for five generations, double crosses between these hybrids, a synthetic variety which was

a composite of sixteen of the selfed lines and nineteen of the selfed lines crossed with the parent variety. Arranged in order of variability, the least first, the results are as follows: single crosses, double crosses, synthetic crosses, line-variety crosses and parent variety. For purposes of canning, uniformity especially in the final stage of development is above all essential.

415. MANGELSDORF, P. C. and REEVES, R. G. 633.15:575.127.5:576.354.4
Genetic and cytological studies in hybrids of *Zea* and *Tripsacum*.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 134-35. (Abst.)

Maize has been crossed with a tetraploid and a diploid *Tripsacum* and with the hybrid of the diploid cross. In the first cross the two *Tripsacum* genomes pair while the ten maize chromosomes behave as univalents and lag. The hybrid is completely male-sterile and no seed has yet been obtained from back-crosses.

Little or no pairing occurs in the second cross and all the chromosomes lag, reduction division sometimes failing completely. The hybrid is completely male-sterile but 3 per cent of seed is set in backcrosses, the fertile egg cells having the somatic chromosome number. In the third cross the two maize genomes pair, the eighteen *Tripsacum* chromosomes behave as univalents. The hybrid is partially female-fertile though male-sterile. Thus there is little or no homology between the chromosomes of maize and *Tripsacum*. On the whole there is a close association between the ratio of the genomes of maize and *Tripsacum* and the expression of their generic characters. The results suggest that if the *Tripsacum* number is the result of duplication this has taken place in the distant past.

A triple generic hybrid between the hybrid of the second cross and *Euchlaena* has been produced.

416. MANGELSDORF, P. C. and REEVES, R. G. 633.15:575.127.5:576.354.4
A tri-generic hybrid of *Zea*, *Tripsacum* and *Euchlaena*.

Amer. Nat. 1933: 67: p. 82. (Abst.)

A certain number of functional female gametes of the hybrid *Zea* x *Tripsacum*, and having the somatic number, produced a triple hybrid with thirty-eight chromosomes when pollinated with *Euchlaena*, the percentage of success being about six. The chromosome number indicates the presence of complete genomes from all three genera and the characters of all are manifested, although those of *Euchlaena* predominate. At meiosis ten bivalents are formed from the ten maize and ten *Euchlaena* chromosomes, the eighteen *Tripsacum* chromosomes remaining unpaired.

417. MCCLINTOCK, B. 633.15:576.354.46
Cytological observations in *Zea* on the intimate association of non-homologous parts of chromosomes in the mid-prophase of meiosis and its relation to diakinesis configurations.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 126-28. (Abst.)

A study of inversions, deficiencies, translocations and trisomics has shown that there may be association of non-homologous parts of chromosomes. The various types of association are described.

418. BURNHAM, C. R. 633.15:576.356
The association of non-homologous parts in a chromosomal interchange in maize.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 19-20. (Abst.)

A segmental interchange is described in which the break in the one chromosome occurred in a different position from that in the other. In spite of this, and the fact that therefore relatively large sections of the pairing threads in heterozygotes do not match, the association appears to be as intimate as in normal bivalents.

419. BEADLE, G. W. 633.15:576.356:575.11
A gene for sticky chromosomes in *Zea mays*.

Z. indukt. Abstamm.- u. VererbLehre. 1932: 63: 195-217.

The fifth gene known to affect chromosome behaviour in maize is here described. The plants are highly sterile although a few functional egg cells and pollen grains are produced. The

chromosomes at metaphase cling together in an apparently viscid mass, which results in great irregularities at anaphase. The somatic divisions also displayed similar, although less pronounced, irregularities and the aleurone cells were smaller. No mosaic endosperms were observed but experiments to detect them are being repeated.

Evidence is presented to show that the peculiarities described are conditioned by one recessive gene *st*, located in the *su-Tu* group. Crossing-over amounting to 12 per cent was observed with *su*.

Extra chromosomes were observed in many of the plants derived from crosses with normals and a non-disjunction rate as high as 3.6 per cent was calculated. Various semisterile plants also occurred in the same progeny, some of which had rings of four chromosomes; other evidence of the occurrence of translocation is given and the mutation rate appeared to be abnormally high.

420. JONES, D. F. 633.15:577.8:575.172

The interaction of specific genes determining sex in dioecious maize.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 104-07. (Abst.)

Crosses of silkless plants in which the ovaries fail to develop with tassel-seed plants having pistillate flowers in both the lateral and terminal inflorescences gave an F_1 of normal hermaphrodites. In F_2 there is segregation into all three classes as well as some plants without lateral inflorescences which could not be classified. Distributing these among the three groups gave a dihybrid ratio.

The data indicate that the gene for silkless is unable to act when the gene for tassel-seed is present. Tassel-seed plants from the F_2 were crossed with pollen from silkless plants heterozygous for tassel-seed and among the progeny were plants recessive for both genes though their female flowers were normal and produced seed.

The effect of such a condition on the mechanism of sex is discussed.

421. KOČNAR, K. 633.15:577.83

Tvorba zrn v prašnikových latách u kukuřice. (The formation of grains in the pollen panicles of maize.)

Věst. (Bull.) Českoslov. Akad. Zemed. 1933: 9: 16-17.

The formation of grain in the male inflorescences occurs in particular years and in certain varieties, generally at the base, seldom in the middle or at the top. It involves a dwarfing of the plant. The quality of these grains is low.

422. BRINK, R. A. and COOPER, D. C. 633.15:581.162.5:576.356.1

Structural changes in the chromosomes of maize.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 16-17. (Abst.)

From the semisteriles involving chromosome interchange and ring formation (see "Plant Breeding Abstracts," Vol. I, Abst. Nos. 73 and 531, Vol. II, Abst. No. 84), plants homozygous for the interchange in semisterile-1 have been obtained, and also for both the semisterile-1 and semisterile-5 interchanges. These plants are fully fertile and apparently normal in ear size and weight, in rate of maturity and crossing-over. The strands pair normally except where the chromosomes change partners.

Crosses of the double homozygote with a third interchange individual involving a common chromosome gave a ring of eight. The chromosomes in all these rings assort at random. The formation of complexes does not therefore result from interchange alone but is thought to result (e.g. in *Oenothera*) from the reversal of segments differentiating two opposed complexes.

423. TAVČAR, A. 633.15:581.45:575.11.061.5

Nasljedivanje dlakavih lisnih rukavaca kod kukuruza (*Zea Mays* L.). (The inheritance of hairy leaf sheaths in *Zea Mays* L.)

Rad. Jug. Akad. Znan. Umj. (Proc. Yugoslavian Acad. Sci. Zagreb) 1932: 244: 74-93.

Among several varieties of *Zea mays everta* grown, two produced a number of plants with thick and long hairs.

As no data are available in the literature on the genetics of this character, the author first

determined three types of hairiness which differ in the length and density of the hair, the type with long hairs being referred to as *pubescens*, that with short hairs as *glabrum*.

These differences are to a certain extent due to environmental conditions.

Then the inheritance of the character was studied in a series of crosses of *pubescens* x *glabrum* plants. Both the length and the density of hairs of the *pubescens* type were always intermediate in the F_1 and appear to be located in the same gene. *Saccharata* endosperm was dominant to *indurata*, presence of ligule to absence, yellow endosperm to white, the inheritance of these characters being independent of that of hairiness. On the other hand, linkage was observed between hairiness and the branching of the panicle, as well as between hairiness and shininess of leaves.

424. HAYES, H. K. 633.15-1.547.25:575.061.633

Heritable characters in maize. XLIII. Zebra seedlings. 633.15:575.116.1

J. Hered. 1932 : 23 : 415-19.

These seedlings are characterized by the appearance of chlorotic bands across the leaves which disappear as the plant reaches maturity.

The character behaves as a simple-recessive but is much influenced by conditions of temperature and only appears when there is suitable variation.

Linkage studies shewed that zebra (Zb, zb) is inherited independently of $Iglg$, liguleless, $Flfl$, flinty versus floury and Yy , yellow versus colourless endosperm and also of the aleurone colour factors, $Prpr$, Rr and Aa .

425. HOOVER, M. M. and GARBER, R. J. 633.15-2.451.2-1.521.6:575.11

The manner of inheritance of smut reaction in maize.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 86-87. (Abst.)

Much variation in the reaction to smut, *Ustilago zeae*, was observed in certain homozygous lines of maize. Crosses between resistant and susceptible lines gave an intermediate F_1 . Association was indicated between smut susceptibility and the linkage groups IV, VI, VII and IX. The F_3 results from crosses between resistant lines indicate that it will be possible to produce strains that are both smut resistant and economically desirable.

Two sets of factors, one controlling the physiological behaviour and the other affecting the morphology of the plant, appear to control the smut reaction of any particular strain.

426. HOOVER, M. M. 633.15-2.451.2-1.521.6:575.116.1

Inheritance studies of the reaction of selfed lines of maize to smut (*Ustilago zeae*).

Bull. W. Va. Agric. Expt. Sta. 1932 : 253 : Pp. 32.

Crosses were made between strains shewing a tendency to infection in the base of the plant or in the tassel respectively. The F_1 resembled the "base" strain and the majority of F_2 plants the "tassel" strain. Fifty per cent of the F_2 plants were smutted. Backcross plants with "base" mostly shewed basal and with "tassel" mostly tassel infection.

Both these types were crossed with two resistant parents, yellow and white ; the type of infection tended to resemble that characteristic of the parent used and backcross progenies resembled the recurrent parent. Backcrossing to the resistants reduced the infection from over 70 to under 20 per cent.

The white resistant every time gave indication of contributing a greater degree of resistance than the yellow resistant. Progenies from the two resistants intercrossed were almost smut-free and types still more resistant appeared in F_3 , on which great store is set for practical breeding.

These respective lines were next crossed with testers of known genetic composition for various linkage groups. The segregates from some linkage groups were more susceptible than others and the F_1 of these strains when crossed with other susceptibles also shewed a higher infection than those of other linkage groups. At least four linkage groups shewed linkage with smut reaction in this way.

In certain cases the morphological characters are such as to affect the smut infection and the choice of testers is of great importance.

There is evidence that two types of resistance exist, physiological and morphological, controlled by different sets of factors.

427. ROBERTSON, D. W. 633.16:575.116.1
Inheritance in barley. 633.16:575.113.7:575.123
 Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 170-71. (Abst.)

A further contribution is made to the knowledge of the linkage groups in barley.

Chlorina *f.f.f.* is inherited independently of Ff and Vv in I, A₁a₁ and Bb in II, Nn in III, Kk and Ii in IV and Ss in V but is linked with Y₂y₂ for green versus virescent seedlings.

The linkage of Kk and Ii shews that Vv the factor pair for 6-row versus non-6-row is independent of Ii the factor pair for intermedian versus 2-row.

P₂p₂ for purple versus colourless straw was linked with Vv with a crossing over per cent of 9.0 ± 0.68 but is inherited independently of Ii.

A study of the effect of the presence of a lethal gene in the heterozygous condition shewed that the development of the plant remained unaffected.

428. INOUE, C. 633.16:576.354.4
(Meiotic mitosis in *Hordeum sativum*.)
 Proc. Crop Sci. Soc. Japan 1932: 4: 304-14.

A detailed description of the process of meiosis in the pollen mother cells of 2 and 6-rowed varieties of barley.

429. SCHULZ, K. G. 633.16:581.48:575
 633.16 Paradies
Die nackten oder spelzenlosen Gersten. (Naked or hull-less barleys.)
 Wschr. Brau. 1932: 49: 225-29.

Descriptions of a number of naked barleys are given, with indications of their origin and illustrations. Of these the Paradiesgerste, bred by R.D. Neugebauer from a 2-rowed naked Asiatic land race, is of interest in its power to grow in extremely unfavourable conditions, by its earliness and comparatively good yield. The malting and other qualities of the barley are highly satisfactory and altogether it is qualified as a barley with great possibilities.

430. KARPEN, R. E., QUINBY, J. B., JONES, D. L. and DICKSON, R. E. 633.174(76.4)
Grain sorghum varieties in Texas.
 Bull. Tex. Agric. Expt. Sta. 1932: 459: Pp. 50.

A history and descriptions of the varieties grown in Texas and an account of their yields.

431. KARPEN, R. E. 633.174:581.48
Multiple seeded spikelets in sorghum.
 Amer. J. Bot. 1931: 18: 189-94.

Double seeds, triple seeds and intermediate stages in which the seeds were not completely separated were found with some frequency in a crop of milo.

432. ROSCHEVICZ, R. J. and REZNIK, M. A. 633.18
 Documents sur le genre *Oryza*. I. L'origine botanique et géographique des riz cultivés. (Works on the genus *Oryza*. I. Origin, botanical and geographical, of cultivated rice.)
 Rev. Bot. Appl. d'Agric. Trop. 1932: 12: 949-56.

A résumé of the work by Roschevitz (see "Plant Breeding Abstracts," Vol. III, Abst. 81).

433. CHEVALIER, A. 633.18:576.16
 Nouvelle contribution à l'étude systématique des *Oryza*. (New contribution to the systematic study of the genus *Oryza*.)
 Rev. Bot. Appl. d'Agric. Trop. 1932: 12: 1014-32.

The morphological description and geographical distribution of twenty species, including spontaneous and cultivated forms, as worked out by Roschevitz and of two new species established by the author, are given. All these species display a great multiplicity of varieties partly due to hybridization.

Rectifications and additions to the systematics of *Oryza* are given. *O. sativa* is considered as a collection of forms which have originated by selection, mutation and hybridization.

434. NAKAMORI, E. 633.18:576.356.5
On the appearance of the triploid plant of rice, *Oryza sativa* L.
 Proc. Imp. Acad. Tokyo 1932 : 8 : 528-29.

In the eighth generation of a cross between Sen'iti and Takenari an abnormal plant was found, characterized by greater size of its parts, smaller number of tillers, presence of awns (the normal type was awnless) and reduced fertility.

Root tip counts shewed thirty-six chromosomes, the number in the normal plant being determined as twenty-four.

Only twelve plants were obtained from a great number of seeds of this plant sown. These had varying numbers from twenty-five to twenty-nine chromosomes and were also abnormal in appearance.

435. MORINAGA, T. and FUKUSHIMA, E. 633.18:576.356.52:576.354.4
Some observations on the microsporogenesis of the haploid plant of rice.
 Proc. Imp. Acad. Tokyo 1932 : 8 : 403-05.

By division thirty-three individuals have been produced from the original haplont (see "Plant Breeding Abstracts," Vol. II, Abst. 638). At meiosis twelve unpaired chromosomes were present, no affinity between them being in any way evident and separation to the poles was quite random. Tri-polar spindles were occasionally observed. The twelve chromosomes are therefore evidently unrelated.

Three more haploid plants have since been found in intervarietal hybrids. They again are dwarfed and highly sterile.

436. NOVELLI, N. 633.18-1.52
Notizie sulla produzione di nuove sementi di riso. (1932). (Information on the production of new rice seed, 1932).
 G. Risicolt. 1933 : 23 : 1-14.

A description (with illustrations of the grains) of strains of rice produced by selection from pure lines, by hybridization and of varieties now acclimatized which are to be offered for distribution in the coming year.

437. IVANOV, N. N. 633.367:581.192:575
(Problem of the alkaloidless lupin.)
 Suppl. 54, Bull. Appl. Bot. Leningrad 1932 : Pp. 63.

Attention is drawn to the importance of the alkaloid-free lupins selected by Sengbusch (see "Plant Breeding Abstracts," Vol. I, Abst. 545) for agriculture also in the Soviet Union.

The Institute of Plant Industry has evolved a method whereby as many as 1,000 plants can be tested for alkaloid content per day by one man and the breeders have already isolated a considerable number of plants of the desired type in all lupin species possessed of agronomic interest. An account is given of the work of Sengbusch, who, however, does not publish his method of testing. The new iodine method of the Soviet laboratory is described, the advantage of the method being its extreme simplicity. All the more valuable species of lupin for agronomic purposes were examined; a larger number of seeds per plant was examined in the cross-pollinated species than in the self-pollinated.

The collection of *Lupinus luteus* of the Soviet Union together with samples from various other countries, examined in the Department of Plant Breeding, shewed the great variability of the alkaloid content in this species. Alkaloid-free seeds were found in samples from Holland and Bremen; in these samples the proportion of such seeds was high, in some lines up to 100 per cent, and the character was inherited from one generation to another. This makes clear the necessity for a search embracing various geographical regions, especially those in whose neighbourhood the desired types have been found.

In the case of *L. angustifolius* only one out of 31,591 plants examined, from the most varied sources, was free from alkaloid. The difference between these and the races containing alkaloid was quite sharp, the latter all containing a quite high percentage.

L. pilosus proved to be variable in the same way as *L. luteus*, nearly every sample containing some seeds with low alkaloid. The hope of finding the desired type is higher therefore in these two species. So far no completely alkaloid-free plants have been found, however, in *L. pilosus* or in *L. mutabilis*. One sample of *L. albus* has been found without alkaloid.

The perennial lupins, *L. polyphyllus* and *L. perennis*, on account of their cold resistance and vigour of growth, should make crops of extreme value. One line has already been isolated which gives no alkaloid reaction in the young leaflets.

In the Division of New Cultures in addition to plants entirely free from alkaloid, plants with remarkably low alkaloid content were found in nearly all species examined and are being used for breeding. Various plants of *L. mutabilis* with reduced alkaloid content were found, others in which it was absent in the vegetative organs. Similarly in *L. luteus*, *L. hirsutus* and *L. angustifolius*.

These findings led to a study of the lupins of the whole world. The centre of multiplicity of the genus lies in the Andes. Here several hundred species exist, mostly small-seeded and perennial, the Old World species being much fewer in number but possessed of large seeds. Attention is being concentrated for the moment on the latter, the New World species being of interest, however, on account of their cold resistance, perennial habit and their possibly greater variability in alkaloid content.

The unbroken gradation between cultivated and wild forms makes the latter an extremely valuable source of breeding material. The alkaloid-free types appear to be concentrated in the western Mediterranean countries and a full study of the cultivated and also the wild forms found there is being undertaken. In the latter it is hoped to find new valuable characters such as immunity to disease, earliness, non-dehiscent pods, drought resistance, self-fertility in yellow lupins and high yield of green material, in addition to absence of alkaloid. Observations made so far shew great promise of obtaining many of these desired characters—e.g. resistance to *Fusarium*, cold resistance in certain Georgian white lupins, which are also used for food without previous washing and may be of extreme value for sandy soils. Some of these also shew qualities highly suited for green manuring.

ROOTS 633.4

438.

SAVITZKY, V. F.

633.41:575.22

Variability and heredity in *Beta*.

633.63:575.22

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 175-76. (Abst.)

Individual and group variability in sugar beet and other varieties has been studied for a large number of characters during a period of six years. Investigation on the inheritance of sugar percentage in the sugar beet are also in progress. Crosses have been made between sugar beet and the mangold, fodder and table beet.

439.

MUNERATI, O.

633.41:581.143.26

Die Fähigkeit der Runkelrübe ohne Reservestoffe der Wurzeln Blütenstengel zu bilden und reife Samen zu tragen. (The capacity of the beetroot to form flower stems and to bear ripe seeds without reserves in the roots.)
Züchter 1932: 4: 279-80.

Experiments were carried out with a race shewing marked annual tendencies; it was possible in the course of one summer to obtain seeds capable of germinating without the plant shewing the least signs of developing the normal fleshy root.

440.

A new variety of beet.

633.41-2.8-1.521.6(73)

Science 1932: 76: Suppl. No. 1973: p. 8.

"U.S. No. 1" is the name of the new variety of sugar beet produced in the United States and the first to be resistant to curly-top. Its yield exceeds by about five tons, and its gross sugar production by about 2,000 pounds an acre, that of commercial varieties.

441. ODÉN, S. and RASMUSSEN, J. 633.41/426:581.035.1
Fröodling med elektriskt hjälpljus. (The raising of seed with the help
of electric light.)
Handl. T. 1933 : Nr. 8 : 1094-1107.

By the use of electric lighting the roots of various kinds of beets and turnips can be induced to flower during the winter, crossings can be made and the F_1 seed sown in the following spring, so saving a year. The practical value of such methods for breeding purposes is obvious.

442. U, NAGAHARU and NAGAMATSU, T. 633.426:575.127:2:581.162.32
633.426:581.162.5
(On the difference between *Brassica campestris* L. and *B. napus* L. in
regard to fertility and natural crossing.)
J. Imp. Agric. Expt. Sta. Nishigahara Tokyo 1932 : 2 : 113-28.

The fertility of varieties of *B. campestris* and *B. napus* was tested under conditions of natural, net, self and cross-pollination. (By net pollination is meant pollination by bees under a cloth net). The results shewed that *B. campestris* is mainly self-sterile and *B. napus* entirely self-fertile. Seventy-six per cent natural crossing was found among varieties of *B. campestris* and nine per cent among varieties of *B. napus*. No natural interspecific hybrids were found amongst the *campestris* varieties, but four per cent were found in the *napus* varieties. The small hybrid seeds could be eliminated by appropriate sieving.

443. TEDIN, O. and NISSEN, O. 633.426:581.162.32
Studier över pollendistributionen i ett rovförfält. (Studies on the pollen
distribution within a flowering field of rutabagas.)
Nord. JordbrForskn. 1932 : No. 6 : 225-41.

A comparatively simple mathematical formula is found for pollen distribution and its practical bearing is discussed.

444. PISSAREV, V. E. and VESSELEVSKY, I. 633.491:575
(Materials for potato breeding.)
Bull. Appl. Bot. Leningrad 1932 : Ser. A (3) : 131-50.

Emphasis is laid on the inadequacy of the European potato material to supply the necessary genes for all the improvements which modern requirements demand from the breeder. Great differences were observed in the sorts in the world collection of potatoes in respect of reaction to ecological conditions, some sorts reacted very strongly, others were very constant in yield. The way in which the sorts are freed from disease before study is described. During the course of this, observations are made on the sorts and the most interesting from the point of view of yield and other agronomic characters kept in view. The method of carrying out the varietal tests is also described and the early, medium and late sorts which proved best in the various years from the point of view of yield and starch content are given. It is exceptional to find a sort combining excellence in both these respects ; such an exception is constituted by the sort Eigenheimer. The qualities and defects of the other sorts are outlined. In all three groups the individual desiderata are scattered through a whole series of sorts and the highest yielders in every case shew a number of defects. The commonly grown sort Richter's Emperor was one of the most inferior. The reaction of the various sorts to virus diseases, *Phytophthora*, wart and bacterial diseases is also indicated. Amongst the cultivated sorts no truly immune types were observed, these being found only amongst the South American species, some of which were also cold resistant. For future progress, therefore, in addition to crosses between different European sorts displaying desirable qualities which it is desired to combine, crosses will also be made involving South American species, which will necessitate the investigation of these species on the lines already applied to the European types. It is already possible to indicate races of some of these species, e.g. cold-resistant races of *S. andigenum* (forty-eight chromosomes), *Phytophthora*-resistant races of *S. Antipovichii*, which are of extreme value for hybridization. Certain early high-yielding forms have already been obtained from crosses of early European with native South American potatoes.

445. APPEL, O. 633.491:575(43)
10 Jahre Arbeit an der Kartoffel in der Biologischen Reichsanstalt. (Ten years work on potatoes in the State Institute of Biology.)
Kartoffel (Berl.) 1932 : 12 : Nr. 3 and 4 :

The Research Institute for Potato Growing has determined morphological characters on the basis of which the numerous varieties of potatoes may readily be distinguished from one another. Experiments have shewn that a serological distinction between the varieties is not possible.

Investigations have been made on the physiology of potatoes, such as root growth, germination of the tubers, etc., on the inheritance of the form of tubers (by K.O. Müller and H. Braun) and on the anatomy of the tubers.

In order to facilitate testing potato varieties for their resistance to wart, Köhler and Lemmerzhal have worked out a new laboratory method of great value.

Investigations on the occurrence of blight shewed that the only means of preventing it consists in breeding resistant varieties.

Professor Müller has crossed a half-wild resistant potato variety from S. America with cultivated potatoes and has obtained a resistant variety free from the disadvantage of deep eyes and long stolons characteristic of the wild type.

Parallel to these breeding experiments, purely genetical investigations have been made. It has been shewn that *Phytophthora infestans* contains no biological races,* and that the inheritance of the time of ripening is independent of the inheritance of blight resistance which shews the possibility of breeding early resistant varieties.

The susceptibility to scab of 111 varieties has been investigated, only four of which proved to be immune.

The occurrence and prevention of various other diseases, such as black leg disease, wart-like protuberances, tuber rot, etc., and the causes of degeneration have also been investigated.

446. KÖCK, G. and GREISENEGGER, K. 633.491:575(43.6)
Tätigkeitsbericht des Kartoffelfachausschusses über das Jahr 1932. (Report of activities of the Potato Committee for 1932.)
Neuheiten Gebiete Pflanzenschutzes, Wien 1932 : Nos. 5 and 6 : 101-08.

The Austrian Committee of Potato Experts has again tested a number of new sorts. One line from a cross of Luise x Welteroberer was very considerably superior to any of the others tested. Emphasis has been placed on wart resistance.

447. KRANTZ, F. A. 633.491:575.42
633.492:575.11.061.6
Observations on the genetics of the potato.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 111-12. (Abst.)

Although normally self-pollinated, potato varieties are usually heterozygous and offer opportunities for selection, ten years' selection of inbred lines has produced fertile plants earlier than the commercial varieties and when crossed with other more vigorous inbred lines the yield of some of the F_1 has been equal or superior to that of the commercial varieties.

Two series of interacting genes are responsible for the production of skin colour. One series affects the periderm and the other the peripheral cortex. In the periderm D and S are the basic genes for colour production, E for red eye colour and A for diffused red colour. In the peripheral cortex C, R and T are the basic genes for colour and with B produce purple colour.

448. APPEL, O. 633.491:575.7
Die Bestimmung der Vitalität der Pflanzkartoffel. II. (The determination of the vitality of the potato. II.)
Züchter 1932 : 4 : 265-66.

In a previous report (see "Plant Breeding Abstracts" Vol. II, Abst. 89), the author described an electrometric method of determining the healthiness of the potato.

* See however "Plant Breeding Abstracts" Vol. III, Abst. No. 236.

As this method appears rather complicated, experiments were carried out by the author and Bechhold on the colloidal structure and the electric conductivity of the tuber. A new method was worked out for measuring the agronomic value of a potato. It consists in inserting a copper sheet into the tuber and leaving the latter in water for 24 hours, first at 37°, then at room temperature. The coloured zone thus obtained in the tissue differs according to the degree of healthiness of the tuber.

The results of these experiments were tested on a great number of individuals. It appears that the electrometric method is more certain, but Bechhold's copper test more simple.

Attempts were also made to determine the vitality of the tuber by its fluorescence phenomena. Healthy tubers displayed a green fluorescence, degenerate tubers milky-greenish. The results obtained with different varieties of potatoes shewed good agreement.

Further investigations will indicate which method is best.

449. MÜNTZING, A. 633.491:576.354.46

Studies on meiosis in diploid and triploid *Solanum tuberosum* L.

Hereditas 1933 : 17 : 223-45.

In the diploid plants investigated twelve bivalents were regularly observed at the first metaphase. There was also a definite grouping of the bivalents into groups of two or more but the association of groups of two was characteristic of the diploid strain.

Meiosis in the triploid was irregular with lagging chromosomes and the formation of micronuclei. Trivalents occurred frequently. Unreduced gametes formed by the fusion of homotypic spindles were observed. As was to be expected there was a high proportion of pollen sterility in the triploid.

The chromosome grouping of a tetraploid variety was also examined. Groups of two, three and four chromosomes were most frequent.

The significance of the secondary association is discussed in the light of recent work on the subject, and the conclusion is reached that some number lower than twelve, probably six, must be regarded as the basic chromosome number for *Solanum tuberosum*.

450. ARLAND, A. 633.491:581.037:575

Das bioelektrische Verhalten der Pflanzen und seine Verwertung im Pflanzenbau unter besonderer Berücksichtigung der Kartoffel. (The bioelectric behaviour of plants and its application in agriculture with special reference to potatoes.)

Angew. Bot. 1932 : 14 : 440-59.

The electromotive force of the currents occurring in potatoes was measured. The investigation of different sections of potatoes shews the electromotive force to decrease with the dilution of the liquid medium, i.e., it is higher at the crown of potatoes; thus these currents give a measure of the vitality of the tuber. Experiments with different varieties shew the electromotive force to be typical of each variety and therefore to be of use in plant breeding.

451. VOSKRESSENSKAYA, O. 633.491:581.162

(Flowering potato tubers.)

Bull. Appl. Bot. Leningrad 1932 : Ser. A (2) : 70-72.

also Amer. Pot. J. 1932 : 9 : 209-11.

Flowers were developed on sprouting tubers of various potatoes, both wild and cultivated. The conditions under which these flowers can be induced are described. Increased moisture and temperature are the principal factors. The artificial induction of flowering is receiving further study.

The Russian article is furnished with illustrations.

452. KOVALENKO, G. M. 633.491-2.111-1.521.6

Hardy frost-resistant potato varieties.

Bull. Appl. Bot. Leningrad 1932 : Ser. A (3) : 127-30.

also Amer. Pot. J. 1932 : 9 : 205-09.

After frosts of up to -5.1°C the condition of the varieties in the collection of the Institute of Plant Industry, Leningrad, was examined. All the European cultivated varieties of *Solanum tuberosum* were killed entirely.

Certain forms cultivated by the Indians of Peru and Bolivia belonging to the new species established by Juzepczuk and Bukasov and other hybrid forms involving these species, which are mentioned, were entirely undamaged. The reactions of other forms and hybrids are indicated. Some species, notably *S. demissum*, *S. semidemissum* and *S. andigenum*, contained both highly resistant and highly susceptible forms. The breeding possibilities are very much extended by the discovery of these new forms.

453. REDDICK, D., CROSIER, W. F. and MILLS, W. R. 633.491-2.411.4-1.521.6:575
Blight immune potato hybrids.
 Proc. Pot. Ass. Amer. 1931: 18: 60-64.

Solanum demissum has been subjected in Ithaca to various conditions and continued absolutely immune. The only crosses which were successful were those with the Rurals, the seedlings from which all proved to be immune. The tubers of the hybrid plants exceeded in size those of *S. demissum*, but the lenticels on their tubers were smaller. The hybrid potatoes appeared to be short-day starch producers. Among the F_2 's thirty-nine were recorded as immune, seven as susceptible. Backcrosses gave also a high percentage of immune individuals.

454. TRÜMPENER, E. 633.491-2.411.4-1.521.6:575
 Die phytophthoraresistente Kartoffel. (The potato resistant to phytophthora.)
 Kartoffel (Berl.) 1932: 12: 103-05.
 Ein neuer Erfolg der Immunitätszüchtung. (A new achievement in breeding for immunity.)
 Umschau 1932: 36: 443-45.

Both these papers report the results of K. O. Müller's work on breeding resistant hybrids. A method for testing potato plants in all the stages of growth and under different conditions is outlined. It is shown that the aim in breeding for immunity is to breed varieties which are infected too late to enable the fungus fully to develop. This was fulfilled by hybrids of cultivated varieties x South American wild forms which received the name "W-races." Although they proved not to be immune in the field, their resistance during the germination of the potato is sufficient to make them valuable in breeding for resistance. A further scheme for crossing cultivated races x W-races is proposed.

455. OBERSTEIN. 633.491-2.412.5-1.521.6
 Das Problem der Umstellung auf krebsfeste Kartoffelsorten (Nach niederschlesischen Erfahrungen 1929-1931.) [The problem of the introduction of potato varieties resistant to wart. (From experiments in Lower Silesia 1929-1931.)]
 Bl. Pflanzenb. u. Pflanzenz. 1932: 10: 4-9.

The necessity of growing exclusively resistant varieties, approximately 100 of which are known in Germany, is emphasized. However, the sudden substitution of the varieties grown for many years by the new varieties recommended for their resistance, and otherwise of doubtful value, involves some uncertainty. The names of the chief varieties, and the number of years during which they have been cultivated, are given. The author recommends breeding varieties which combine resistance and high starch content, such as is displayed by *Parnassia* and *Deodara*.

FIBRES 633.5

456. CHRISTIDIS, B. G. 633.51(49.5)
 La culture du coton en Grèce. (Cotton culture in Greece.)
 Coton et Cult. Coton. 1932: 7: 71-81.

Contains remarks on the varieties in cultivation, now nearly all American, and on the new Hellenic Cotton Institute, the object of which is to research into all cotton questions and to encourage cotton cultivation.

457. O'KELLY, J. F. and HULL, W. W. 633.51:519.241.1:677.2
Parent-progeny correlations in cotton.
 J. Amer. Soc. Agron. 1933 : 25 : 113-19.

The purpose of the present paper is to shew how far certain selection characters of the parent plants are reproduced in the progeny.

The characters studied are lint yield, lint percentage and staple length, and the varieties used are Trice, Miller and Lone Star.

Coefficients of correlation between each of the characters in the parent plant and the three characters in the progeny are reported. It appears that lint percentage and staple length, but not lint yield, can be used to determine, before planting, which plants must be discarded.

458. 633.51:575(54)
Activities of the Indian Central Cotton Committee.
 Int. Rev. Agric. Rome 1932 : 23 : 423-25.

A survey of the chief problems and results. Of the new strains evolved the "Early Strain," which excels the present variety 4-F in yield, ginning percentage and staple, and is very early and resistant to the effects of adverse climatic conditions, is outstanding ; it has proved susceptible to jassid, but certain resistant lines have now been isolated from it.

459. HORLACHER, W. R. and KILLOUGH, D. T. 633.51:575.243:537.531
The production of mutations in American upland cotton by radiations.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 87-90. (Abst.)

The radiation of the dry seed of *Gossypium hirsutum* produced a large number of variants. There was evidence of inherited changes in X_2 . Yellow seedlings which behaved as simple recessives occurred in X_2 but not in the controls.

Radiation of the seed of plants homozygous for forked leaf (nn) gave an intermediate (Nn) X_1 and in X_2 a plant with normal leaves NN occurred. Seeds with embryos heterozygous for leaf shape were X-rayed, and among the progeny of the selfed bolls from these plants some produced only plants with normal leaves.

The radiation of the seed of virescent yellow plants produced some green plants, another example of a progressive gene mutation.

460. BOLT, A. S. and BOLT, A. O. 633.513:575(92.2)
 Eén en ander over kapokselectie op de onderneming Nieuw-Gebangan.
 (Notes on the selection of kapok on the Nieuw-Gebangan Estate.)
 Bergcultures 1933 : 7 : 101-04.

Certain high-yielding trees have been kept under observation and of these, two were retained on account of their apparent homozygosity. One of these, characterized by failure of the lowermost shoots to shed, gave an annual yield of 1,600 fruits under poor conditions of growth. One of the cuttings of this tree planted in 1927, by 1932 gave as many as 2,975.

From one bouw of seedlings of this tree planted in 1925-26, 284,120 fruits or about twenty piculs pure kapok was produced, the average yield per tree being 4,060 fruits.

The spreading habit of growth was characteristic not only of the trees themselves, but also of the roots. It is to this type of growth that the high yields are attributed.

The low branching prevents its use as a shade for cacao and other crops and is thus a disadvantage, for which reason hybrids between this and other types have been made. The seedlings were sown in 1926 and gave a very satisfactory performance in 1932. Some trees which were in no way outstanding in the early years gave very high yields in later years. Other trees reach their maximum output only after a long time and are therefore undesirable.

The hybrids were more or less of the ordinary type and began to bear at $1\frac{1}{2}$ years, they were more vigorous in growth than either parent, also earlier.

Buddings have been made of the hybrids.

461. SAVELLI, R. 633.522:575.242:581.45
Studien über den Ferrarischen Hanf. (Studies on Ferrari hemp.)
Züchter 1932: 4: 286-90.

A brief account of the various hemp regions of Italy. A peculiar recessive "pinnatifidofilla" mutant is described which has been found in various places. The author concludes that the Ferrari hemp has produced the mutation, which has also appeared in America in material arising from crosses with Ferrari hemp.

Another anomalous type, "monofilla," proved to be independent of the first and not apparently hereditary. It occurred frequently as a bud mutation, usually as a result of some external stimulus.

SUGAR PLANTS 633.6

462. COSTANTIN, J. 633.61:575.73
Hérédité montagnarde acquise par la canne à sucre. (Mountain heredity acquired by the sugar cane.)
C. R. Acad. Sci. Paris 1932: 195: 345-47.

The author quotes observations of McRae and Subramanian in which thin canes grown in cold countries were free from disease and thick canes in hot countries were attacked, whilst the former in hot and the latter in cooler conditions gave varying percentages of infection. The results are taken to prove a Lamarckian conception of acquired inheritance.

463. JESWIET, J. 633.61:576.16
Geografische verspreiding van het geslacht *Saccharum* en de bakermat van het suikerriet. (Geographic distribution of the genus *Saccharum* and the cradle of the sugar cane.)
Hand. XXIIIe Ned. Nat.- en Geneesk. Cong. Delft 1931: Pp. 4.

The thick canes with coloured stems belonging to *S. officinarum* and growing in the tropical belt are distinguished from the subtropical canes representing the two species *S. sinense* Roxb. and *S. Barberi* Jesw. The latter group are characterized by many features associated with *S. spontaneum*.

Ritter, on linguistic and historical rather than botanical grounds, pointed to India and Cochin China as the original home of the sugar cane. The present author makes reference to the concentration of forms of *S. officinarum* in New Guinea, the primitive Papuans cultivating round about 400 different forms, many of which are identifiable with well-known commercial types. The number of forms rapidly diminishes on passing away from New Guinea.

New Guinea is therefore regarded unquestionably as the centre of origin of *S. officinarum*. On an expedition to this country to collect new material for breeding, a new type of cane, closely resembling *S. officinarum* but characterized by extremely luxuriant growth was found. It was named *S. robustum*.

The new cane lacks the high sugar content of the common *S. officinarum*, but possesses other valuable breeding characters, e.g. its great length.

With the discovery of this cane *S. officinarum* no longer stands isolated from the wild cane species and this is regarded as an important step in the solution of the origin of the noble cane.

464. COSTANTIN, J. 633.61-2.8:581.036.5(54)
Les cannes sauvages de l'Inde. (The wild sugar canes of India.)
Rev. Bot. Appl. d'Agric. Trop. 1932: 12: 1001-13.

The wide infection of the sugar canes in Java by sereh, a mysterious disease related to mosaic, created the need of finding resistant varieties which could be crossed with the susceptible ones. It was observed that the wild cane varieties, like Chunnee and Puri, in the Himalaya region, are resistant to cryptogamic diseases. These varieties were, therefore, introduced to Java and crossed with the susceptible cultivated ones. The crosses proved resistant to sereh, but were infected by mosaic after 23 years.

Various thin sugar canes, partly hybrids, which were cultivated in districts with different

climates are described. It is shewn again that cultivation in a cold climate increases the resistance, while the transference to a hot country decreases it.

Thick sugar canes are shewn to be very susceptible, except P.O.J. 2727, Cavanjire and P.O.J. 2714. However, these hybrids are extensively cultivated in America, where the pathological form is "mild."

465. SAILLARD, E. 633.63:575.127.2
L'Institut International de la betterave à sucre. Réunions de janvier 1933.
(International Institute of sugar beet. January meetings 1933.)
C.R. Acad. Agric. Fr. 1933: 19: 219-31.

Brief account of the addresses delivered on the occasion above, some of which are concerned with wild beets and their crosses.

Wild beets from different parts of France were studied in relation to size, shape, chemical content and number of vascular bundles. The figures given shew Atlantic wild beet to have more similarity to sugar beet than Mediterranean wild beet. The cross Atlantic wild beet x sugar beet gave offspring satisfactory as regards the sugar content and number of vascular bundles.

466. KHARECKO-SAVITZKAYA, E. J. 633.63:576.356:575.11
Chromosomal aberrations as a result of transgenation.
Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 107-08. (Abst.)

A gene has been found in sugar beet which causes the formation of polynucleated cells and so of various chimeras and polyploids. Crosses have been made of a normal race with eighteen chromosomes and one with the same number of chromosomes but with the mutable gene. All kinds of chromosomal aberrants and chimaeras occurred among the progeny.

STIMULANTS 633.7

467. DUFRENOY, I. 633.71:57.087.1
Tabac. (Tobacco.) 633.71:575
Bul. Cult. Tutun. 1932: 21: 292-356.

A general account of the biometrics and genetics of tobacco.

468. KOSTOFF, D. 633.71:575.127.2:576.3
Cytogenetics of a *Nicotiana* and a *Triticum* triple hybrid. 633.11:575.127.2:576.3
Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: p. 111. (Abst.)

A fertile hybrid has been produced from the cross *Nicotiana tabacum* $n = 24 \times (N. sylvestris$ $n = 12 \times N. Rusbyi$ $n = 12)$ with 28 $2n$ chromosomes and a combination of the morphological characters of all three species.

A similar method has produced the partially self-fertile triple *Triticum* hybrid *T. dicoccum* $n = 14 \times T. monococcum$ $n = 7 \times T. vulgare$ $n = 21$ with 42 $2n$ chromosomes and the characters of the three species.

The value of such combinations for plant breeding is pointed out.

469. GOODSPEED, T. H. 633.71:576.356.4:537.531
Chromosome unbalance and the asynaptic condition as induced in
Nicotiana by X-radiation.
Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 67-69. (Abst.)

In spite of the smaller chromosome number in *N. sylvestris* the series of products and by-products induced by treatment with X-rays is quite comparable to that of *N. tabacum*.

In X_3 and X_4 there occurs a number of trisomics among the unbalanced types as well as asynapsis. The explanations for the types of trisomics, either "normal" or those shewing an asynaptic condition, are discussed.

Besides these types, there occur in X_3 pure breeding races which differ in their external features and which may represent either the result of transgenation or of deletion.

The results of X-ray treatment on *N. sylvestris* is very similar to that on *N. tabacum*, but in the former all the alterations so far are on the plus side.

470. CLAUSEN, R. E. 633.71:576.356.5:576.16
Cytological and genetical features of monosomic derivatives in
Nicotiana.
Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 23-25. (Abst.)

A variety of new types resulted from fragmentation, crossing over with the normal chromosome, etc. on the part of the monosomic F chromosome, with which these studies were mainly concerned.

471. CHRISTOFF, M. 633.71:581.162.51:575.11
Male sterility in *Nicotiana*. 633.71:575.127.2:575.183
Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : p. 20. (Abst.)

From the cross *N. nudicaulis* ♀ x *N. rustica* ♂ a diploid *rustica* plant was obtained. Its anthers were completely abortive however, but set seed normally when pollinated by *rustica*. This progeny shewed the presence of two factors whose joint action caused fifty per cent of the pollen in the F₁ and in certain of the F₂'s to be non-viable.

472. LEGROS, J. 633.71.00.15(46)
The organisation of experimental tobacco growing in Spain.
Int. Rev. Agric. Rome 1932 : 23 : 419-21.

The work includes breeding by selection and hybridization.

473. ZALDASTANISHVILI, SH. G. 633.72:576.312.32
[On the chromosomes of the tea plant *Camellia sinensis* (L) O. Ktze].
Bull. Appl. Bot. Leningrad 1932 : Ser. 11 (1) : 242-50.

Plants of a Chinese variety of *Camellia sinensis* were examined by Levitsky's method. The number of somatic chromosomes, observed in the root tips, was thirty, confirming the figure given by Cohen Stuart on what the present author points out to be very insufficient material. By examining the clearest chromosomes in a series of plates a provisional diagram was made of the morphology of the fifteen individual chromosomes. This idiogram is illustrated and the individual pairs comprising it are described.

474. ŌNO, H. 633.72:576.312.35
(Chromosome number of *Thea sinensis*.)
Proc. Crop Sci. Soc. Japan 1932 : 4 : 319-21.

The diploid number of chromosomes in *Thea sinensis* is found to be thirty.

475. BOLT, A. S. and BOLT, A. O. 633.74:575.12(92.2)
Cacao-Veredeling op de Onderneming Nieuw-Gebangan. (Cacao breeding
on the Nieuw-Gebangan estate.)
Bergcultures 1932 : 6 : 1289-91.

Observations have been made on a number of mother trees and some of their daughter plots are now in production. All selfed progenies of high yielding trees have been very variable with regard to yield. One Forastero progeny planted in 1926 gave in 1932 an average yield of 63 fruits per tree, the maximum per tree being 88 and the minimum 27 ; for a second Forastero progeny the corresponding figures were 52, 96 and 22, and for a third 42, 65 and 20. The form and colour of the fruits of the progeny of one tree were uniform. Two aberrant trees, which also gave the remarkable yields of 140 and 249 fruits respectively, were ascribed to spontaneous hybridization. This fact suggested hybridization rather than pure breeding as a suitable means for improvement. The Djati Roenggo hybrids have also shewn clear signs of loss of vigour on inbreeding.

Consequently large numbers of hybridizations were carried out, using trees whose productivity figures were already known.

In 50 fruits, containing 1,470 seeds, of a Criollo x Forastero cross, only 2 were white (selfed Criollo), the rest purple and thus true hybrids. The proportion of failures by Wellensiek's method of crossing is to be determined and if this is no greater his method will be preferred.

All F₁ plants were considerably more vigorous than the parents, especially in crosses of two Criollos. They were also less severely attacked by *Phytophthora Faberi*.

OTHER PLANTS

476. MELLO GERALDES, C. DE 633.855.34(67.3)
Renseignements sur le palmier à huile en Angola. (**Notes on the oil palm in Angola.**)

Anais Inst. Sup. Agron. Lisboa 1930 : 3 : 142-50.

The distribution of the oil palm in three different zones of Angola is described and a map appended. The list of oil palm varieties in Angola shews that almost all the varieties thus far known are present. The composition of these varieties is determined. Breeding for fruits with thin shells and pulp rich in oil is recommended.

477. MELLO GERALDES, C. DE, DUARTE, C. and GOUVEIA, F. 633.855.34(67.3)
Contribution à l'étude des fruits des variétés de palmiers à huile et de leurs huiles. (**Contribution to the study of the fruits of oil palm varieties and of their oil.**)

Anais Inst. Sup. Agron. Lisboa 1930 : 3 : 227-64.

The results of the analyses of several samples of fruits of almost all the varieties in Angola are presented in a series of tables.

The classification of the varieties studied is that of A. Chevalier.

The weight and size of the fruits of the different varieties are given in the first four tables. The physical and chemical composition of the fruits, with special reference to the oil percentage, is studied in relation to the thickness of the shell ; it appears that the oil percentage is generally higher in varieties with thin shells. The author suggests crossing the latter with var. *macrocarpa* Becc., which has thick shells but large fruits.

No correlation could be found between the composition of the pericarp, the oil content of the fruit, the weight of fruits and kernels, etc. This makes breeding oil palms very difficult.

478. HEUSSER, C. 633.912:575(92.2)
Opbrengstcijfers van legitieme *Hevea*-zaailingen in 1931 in den proeftuin Soengei Pantjoer. (**Yield figures from legitimate *Hevea* seedlings in 1931 in the Soengei Pantjoer experimental garden.**)

Arch. Rubberc. Ned.-Ind. 1932 : 16 : 364-91.

The tapping results are given for seedlings from 1920 crosses, from isolated seed gardens and from 1923 crosses. The average yield for the sixth year of tapping was very slightly less than that of 1930, but this is accounted for by the fact that a new panel was used at the beginning of the year.

The change in annual average order of the families from that of the preceding year is attributed to differences in wound response when a new panel is used.

The highest annual yield for individual trees was again given by Mother tree 352.

In general the greatest increase in girth was again given by those families with the best development in youth.

Data are given for an estimation of the wood supplies in plantations of *Hevea*.

In this year all trees formerly attacked by brown bast were taken into tapping again on the new panel. Some new but mostly slight cases of brown bast are recorded and some relapses which were mostly severe. A number of trees formerly attacked did not shew a relapse. An increased susceptibility to the disease is noted each year.

The increase in yield and the development of the trees of the 1923 crosses are very satisfactory.

479. HOOP, D. J. N. VAN DER 633.912-1.557
Kan een eenvoudige betrouwbare methode worden gevonden voor de beoordeeling van oculaties en zaailingen voor uitdunningsdoeleinden? (**Can a simple reliable method for judging the value of buddings and seedlings for purposes of thinning be found?**)

Arch. Rubberc. Ned.-Ind. 1932 : 16 : 410-15.

Individual tappings were seen to deviate sometimes considerably from the general trend and it is clear that judgment can only be based on a series of observations and not on isolated ones. Four tappings at intervals of three months gave more reliable results than in four consecutive months, both for seedlings and buddings.

480. KOSTYUCHENKO, I. A. 633.913:581.162
 (A contribution to the biology of flowering of *Scorzonera Tau-Saghiz*
Lipshiz et Bosse.)
 Bull. Appl. Bot. Leningrad 1932 : Ser. A (2) : 53-69.

The plant in question, regarded as a likely substitute for rubber, was found in Kazakstan in 1929. It is promising both in the percentage and quality of the rubber it furnishes.

Preparatory to breeding operations a full study was made of the floral biology, at a special station established for the study of the plant in the region of its discovery, of which the ecological conditions are described in some detail.

The general characters of the plant are described ; it displays variation both in morphological characters and rubber content.

The flowers and the course of flowering are described. Three different methods of emasculation were tried. The best proved to be the removal of the corolla tube in its entirety, when the tube is wide enough to perform the operation.

No seeds were produced by isolating single inflorescences but when two—ten were enclosed in the same isolator a small percentage of seeds developed—0.25—2.19 per cent. This low percentage suggests that the mechanical agent for pollination is absent. Proterandry or self-sterility may be involved.

Artificial pollination was carried out by applying a whole inflorescence unless pollen was scarce. A second pollination reduced the percentage set, apparently owing to injury resulting from pollination. The receptivity of the stigma began to diminish on the third day after emasculation and pollination after the fourth day was ineffective.

The author recommends that emasculation be carried out one—two days before flowering, at 2—5 a.m., pollination being effected two days later from 8—10 a.m.

The amount of pollen carried by the wind to a distance of 1.5 m. from the plant was negligible. To test the occurrence of apogamy certain flowers were isolated unpollinated after emasculation, others after also removing the stigmata. No seeds developed in these circumstances.

Artificial pollination with pollen from the same plant gave a lower percentage set (10.45 per cent) than pollen from other plants (17.77 per cent). Emasculated plants were also left without isolators. These developed 1.73 per cent seeds, whereas plants emasculated and enclosed with a coarse tissue whose perforations were larger than the pollen set none. Insects evidently therefore play a certain role in pollination.

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481. LINSBAUER, L. 634.00.15(47)
 Die gartenbauwissenschaftlichen Institute Russlands. (The horticultural
 research institutes of Russia.)
 Gartenbauwissenschaften 1931 : 6 : 691-93.

1. Institute for vegetable crops, Tekstilschiki. Director : Birs. Publication Sotsialisticheskoe Plodovodstvo i Sadovodstvo. Plans for 1932 include breeding for northern regions, for moist and dry subtropics, for drought regions.

2. Institute for southern fruit culture, Kiew. Director : Tilni. Publishes in the above journal. Plans include breeding and genetics (race improvement).

3. Institute for northern fruit culture, Mitschurinsk-Kozlow. Director : Reibert. Similar plans to previous institute.

4. Viticultural Institute, Tiflis. Director : Allania. General and technical.

5. Institute for potato culture, Malachowka. Director : Epichin. Plans include breeding new types, selection and genetics, study of systematics, yield increase and earliness, resistance to frost and drought.

482. WILCOX, A. N. 634.1/8:575
 The importance of the parental genotype in the breeding of fruits.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 212-13. (Abst.)

The importance of the study of the genotype rather than the phenotype in fruit breeding is stressed.

For strawberries and grapes self-fertilized lines of numerous varieties are grown and selected for further breeding.

For self-sterile fruits such as apples and plums varieties are intercrossed and the progenies of several combinations compared.

Crossing with a homozygous "tester" may also be of use and in this connection parthenogenetically obtained varieties may be of value. For these the method of pollinating one species with another incapable of effecting fertilization has been suggested by East. A study of some of these "false hybrids" among *Prunus* species is in progress.

483. BREGGER, J. T. 634.1/3:575.252

A survey of bud mutations among deciduous fruit varieties.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 10-12. (Abst.)

Various advantageous mutants have occurred from time to time. Amongst these the most outstanding in the apple are the colour mutants, in the pear the giant and russet. Early and late sports are also often valued and sports having different fruit shape have been observed, in addition to differences in fertility.

Amongst other interesting cases are mentioned seedless sports in apples.

484. 634.1/2:581.162.5:576.356.5
634.71:575.11:576.356.5

DARLINGTON, C. D., CRANE, M. B. and LAWRENCE, W. J. C.

Genetic investigations in cultivated fruits.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 36-38. (Abst.)

All the varieties of diploid sweet cherry used were self-incompatible and many were cross-incompatible. The hexaploid plums *Prunus domestica*, could be grouped as self-compatible, partially self-compatible or self-incompatible.

It is found that there exists an inverse correlation between chromosome number and complexity and the frequency of incompatibility, so that there is less incompatibility amongst the more complex apples than the simpler plums or still more simple cherries.

Cytological investigations shew that except in the apple group where there is not so close a connection between seed fertility and fruit production, the odd numbered polyploids (triploids and pentaploids) are less fertile and not of much value.

The inheritance of characters is found to be related to the chromosome complexity of the group concerned.

485. MACOUN, W. T. 634.11:575.12

The Northern Spy apple, a parent in breeding new varieties.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : p. 132. (Abst.)

Northern Spy is considered to be a good parent for use in cross breeding.

486. KRUMBHOLZ, G. 634.11:575.182

Untersuchungen über das Vorkommen von Xenien und Metaxenien bei Äpfeln. (Investigations on the occurrence of xenia and metaxenia in apples.)

Gartenbauwissenschaften 1932 : 6 : 404-24.

The varieties Ananas Reinette, Graue Herbstreinette and Canada Reinette were pollinated with various other varieties. No xenia in the seeds or metaxenia in the fruits was observed, beyond the fact that certain pollenizers produced larger fruits than others.

487. NEBEL, B. R. 634.11:575.182

Metaxenia and xenia in apples.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 140-41. (Abst.)

McIntosh and Yellow Bellflower were used as the differential pollen parents on a Fameuse tree. The metaxenia effects in height, breadth and weight of fruit were on an average greater in the Yellow Bellflower cross. The number of seeds (xenia) averaged 5.8 per apple in the Yellow Bellflower cross and 4.6 in the McIntosh cross—seed length also differed in the two crosses.

In another set of experiments Red Astrachan and Yellow Bellflower were pollen parents on a tree of McIntosh. The breadth and weight of the apples and their acidity by titration was greater in the Red Astrachan cross, the pH value slightly smaller. For the effects of xenia, seed length was smaller as well as average seed number. There was no correlation between seed number and apple size in any of the crosses. Further experiments are being made.

488. HOWLETT, F. S. 634.11:576.356:581.162.5
The relationship of chromosomal irregularities in megasporogenesis to the fertility and fruitfulness of varieties of *Malus*.
 Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 90-91. (Abst.)

A number of chromosomal irregularities during megasporogenesis observed in several varieties of the cultivated apple were associated with abortive embryos. The same varieties showed a high proportion of abortive pollen and are either odd multiple polyploids or aneuploids. The conclusion that triploids are as fruitful as diploids is questioned. The triploids Baldwin, Gravenstein and Bramley's Seedling are as productive as diploid varieties but a number of triploids and other polyploid varieties examined show chromosomal aberrations and great variability in fruitfulness.

489. ELSSMANN, E. and VEH, R. v. 634.11:576.356.4
 Beiträge zur Frage nach den Befruchtungsverhältnissen der für Deutschland wirtschaftlich wertvollsten Kern-, Stein- und Beerenobstsorten. I. Nachweis der Reduktionsteilung im weiblichen Archospor von *Malus* (bei der Sorte "Schöner von Boskoop"). [Notes on the question of the fertility relationships of the varieties of pome, stone and berry fruits most important for Germany. I. Proof of reduction division in the female archospore of *Malus* (in the variety Boskoop Belle).]
 Gartenbauwissenschaften 1931: 6: 1-54.

Studies were made of a tree of Boskoop Belle which flowered in October owing to diseased conditions. The development of the archesporia was studied and is described and illustrated. The female archospore proved to be haploid. The reduction division was followed in both male and female cells in which it was identical, no disturbances being observed in the development of the female cells.

490. MURNEEK, A. E. 634.11:581.162.3
Apple pollination, an evaluation of methods and pollenizers.
 Res. Bull. Mo. Agric. Expt. Sta. 1932: 175: Pp. 31.

The advantages and disadvantages of the branch unit method of pollination carried out by hand, and of the screened cage method using package-bees for the pollination, are discussed in detail. Comparative experiments were carried out by both these methods on a series of apple varieties during 1929-1931. The results are presented in tabular form. It appears that both these procedures offer definite advantages over the popular paper-bag method. It was also found that certain varieties of apples, e.g. Jonathan, Delicious and Ben Davis, are better pollenizers than others.

491. CSORBA, Z. 634.11-2.42
Vizsgálatok az almafajták lisztharmat iránt való fogékonyságának és ellenállóságának okairól. (Investigations on the causes of the susceptibility and resistance of apple varieties to apple mildew.)
 Mezőgazdasági Kutatások 1932: 5: 326-40.

As the infection by apple mildew (*Podosphaera leucotricha* Ell. et Everh. Salm.) appears to be limited to the epidermal cells only, there is evidence that the thickness of the external walls of the epidermal cells is one of the factors influencing resistance to mildew. The author measured the thickness of these cell walls in a series of apple varieties. The results given show that the average thickness in resistant varieties does actually exceed by 0.54 μ that in susceptible varieties.

492. SMITH, C. O. 634.21:581.466
Double flowers and multiple fruits of the Japanese apricot.
 J. Hered. 1932 : 23 : 411-14.

Two seedlings of the Japanese apricot (*Prunus mume* Sieb and Zucc.) grown at the Citrus Experiment Station had large double flowers. One white and the other reddish purple. Both varieties were observed to produce a number of multiple fruits, two—four to a flower. Differences between the two varieties are described.

493. MORETTINI, A. 634.22:581.162.3
Sull'autosterilità ed autofertilità dei susini. (Self-sterility and self-fertility in plums.)
 Ital. Agric. 1932 : 69 : 961-83.

Observations were made on flowering, pollen germination and sterility in various plum varieties; remarks on the value of different plums as pollenizers are given.

494. RIETSEMA, I. 634.22/3:581.162.5
Bestuivingsproeven bij kersen en pruimen. (Pollination trials with cherries and plums.)
 Fruittelt 1932 : 22 : 197-201.

All cherries were self-sterile and probably inter-fertile. A list is given of a useful combination of varieties.

The Dubbele Boerewitte, known in Germany as the Jungfern and in Sweden as the Vitt Jung plum, produces no pollen. Experiments were made to find a suitable pollinator. Some plums were self-fertile.

495. SACHOFF, T. 634.22/4:581.162.5
Untersuchungen über die Fruchtbarkeit der Süßkirschen-, Sauerkirschen-, Zwetschen- und Pflaumensorten. (Investigations on the fertility of sweet cherries, morella cherries, plums and German prunes.)
 Gartenbauwissenschaften 1931 : 5 : 574-79.

The above fruits were investigated with regard to self-sterility and inter-sterility. Of all the sweet cherries investigated only the "white Merdianka" and of the morella cherries only the "Ostheimer Weichsel" shew an abnormal number of chromosomes.

Dwarf pollen grains are often observed.

In the pollination experiments only the morella cherries and the plums have to be emasculated.

All the sweet cherries are self-sterile and two inter-sterile groups also exist.

Among the morella cherries only the "Ostheimer" cherry and "Königin Hortensie" are self-sterile. No inter-sterility is found.

In the plum group only Reine-Claude is self-sterile.

Cross-fertilization appears mainly to be effected by the honey-bee.

Recommendations as to the varieties of cherries to be grown in Bulgaria are given.

496. KINMAN, C. F. 634.25:575.252
A peach mutation.
 J. Hered. 1932 : 23 : 453-56.

A bud variation is described with lemon yellow leaves which gradually turn to a nearly normal green. The fruit borne on the mutant branches is also lighter in colour. The mutation can be vegetatively propagated.

The flowers, when open-pollinated, produced both green and yellow-leaved seedlings.

497. TANAKA, T. 634.3(52)
(The discovery of *Citrus tachibana* in Formosa, and its scientific and industrial significance.)
 Studia Citrologica 1931 : 5 : 1-20.

A climatic and botanical description is given of the part of Formosa where *C. tachibana*, which has previously been known only in Japan proper, was discovered.

The possible occurrence in southern Formosa of *C. tachibana*, thus far found only in the northern part, is suggested.

498. FROST, H. B. 634.3:576.356.5:581.163
Fruit characteristics of autotetraploids in citrus.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 57-58. (Abst.)

The autotetraploids described shew a considerable range of variation but they are all decidedly inferior in economic value to the diploid varieties.

499. UPHOF, J. C. T. 634.3:581.466
Wissenschaftliche Beobachtungen und Versuche an Agrumen, IV. Der polygamische Zustand einiger Citrusarten. (Scientific observations and experiments on citrus, IV. The polygamous state of some citrus species.)
 Gartenbauwissenschaften 1932 : 7 : 121-41.

This is a study of the abortion of the gynaecium and the formation of male flowers. Male flowers have been observed in various citrus species.

The occurrence of male flowers in various hybrids whose one parent is hermaphrodite and the other produces a number of male flowers, was studied. In such hybrids as the Tangelos and Temple Orange on the other hand, whose parents do not produce male flowers, no formation of male flowers was observed.

It is believed that the formation of male flowers is due to an insufficient supply of nutrient material. In spite of this it is clear from the above facts that the capacity to produce flowers of this type is inherited and is dominant in the F_1 .

500. TANAKA, T. 634.3:581.9(52)
 (On the centre of the origin of the *Citrus* fruits.) 634.3:576.16
 Studia Citologica 1931 : 4 : 179-205.

This paper is a detailed study of the distribution of *Citrus* fruits in the east Asiatic region. It appears that eastern India is the native home of all important *Archicitrus* and *Metacitrus* species.

Four other regions, extending from Indo-China and the Pacific Islands northward to Japan, and the *Citrus* species occurring there, are described. These regions are considered to be only extensions of the eastern India region, where most of the *Citrus* species are present.

501. SWINGLE, W. T. 634.31:575.182:575.127.2
Recapitulation of seedling characters by nucellar buds developing in the embryo sac of *Citrus*.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 196-97. (Abst.)

The majority of the hybrids (citranges) between *Poncirus trifoliata* the trifoliate orange and *Citrus sinensis* the common orange are completely ovule-sterile but when pollinated they produce seeds from the nucellar tissue whose seedlings exactly resemble the F_1 hybrid.

Senescence in *Citrus* varieties is marked by the decrease in size or disappearance of spines, these nucellar bud seedlings, however, possess spines and other signs of rejuvenescence even though no spines were present on the branch of the tree on which the fruit developed.

This change called "neophyosis" is effected, it is suggested, by the influence of the embryo sac apparatus within which the nucellar bud develops.

502. UPHOF, J. C. T. 634.31:581.47
Wissenschaftliche Beobachtungen und Versuche an Agrumen. III. Eine monokarpelle Apfelsine. (Scientific observations and experiments on citrus. III. A monocarpous orange.)
 Gartenbauwissenschaften 1931 : 6 : 402-03.

An abnormal type of the variety Valencia Late was found in an orange plantation near Orlando. The individual found differed from the normal type by its cylindrical shape and the reduced number of sepals. A cross section shews this fruit to consist of one carpel only.

503. ROBINSON, T. R. 634.32:575.127.2:576.16
Remote ancestral characters appearing in first generation hybrids of citrus and *Poncirus*.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 171-73. (Abst.)

Plants with pinnate leaves have been found on seedlings of citrange (hybrid between the common orange *Citrus sinensis* and the trifoliate orange *Poncirus* or *Citrus trifoliata*). The seedlings have an apogamic origin and the variety in question is used as a root-stock for citrus fruits. Neither parent has ever produced pinnate leaves, yet about three per cent were found among the seedlings, though only during the period of maximum vegetative development. It is suggested that the production of pinnate leaves represents an ancestral character brought to light by hybridization.

504. JULIANO, J. B. and CUEVAS, N. L. 634.441:581.46
Floral morphology of the mango (*Mangifera indica* Linn.) with special reference to pico variety from the Philippines.
 Philipp. Agric. 1932 : 21 : 449-72.

This paper deals with the question of whether all the embryos that develop in the seed of our polyembryonic mangoes are nucellar in origin and whether the zygote takes an active part in the formation of the embryos in a single seed.

The development of both hermaphrodite and staminate flowers is described. Usually only one of the stamens becomes functional. The fertilized zygote later gives rise to an embryo. The adventitious embryos are all derived from the nucellus and belated in growth. They completely absorb the endosperm of the embryo sac. The pericarp of the fruit differentiates into three distinct layers, the nucellus being not completely absorbed.

505. WELLINGTON, R. 634.51:575.127.2
Breeding walnuts.
 Proc. Nth. Nut Gr. Ass. 1931 : 22 : 15-21.

Juglans nigra was crossed with *Juglans regia* in order to obtain a hardy nut. The hybrid trees proved unproductive; no hybrid vigour was observed in the first generation; especially the size of the fruit was smaller than in *Juglans regia*. These trees will be more valuable for ornamental or timber uses.

It is suggested that promising results can be obtained in backcrosses of these hybrids with *Juglans regia* as the male parent.

506. NEBEL, B. R. 634.51:576.312.35
Cytological aspects of breeding nuts.
 Proc. Nth. Nut Gr. Ass. 1931 : 22 : 22-24.

The value of studying the cytology of cultivated plants in breeding work is emphasized. Some chromosome counts of certain species and hybrids of *Juglans* and *Corylus* are given.

507. NIXON, R. W. 634.62:575.182
Metaxenia in the date palm and its genetic implications.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 142-43. (Abst.)

Slight differences in shape and size of the fruit are caused by metaxenia in the date but considerable variation may occur in time of ripening of the fruit according to the variety of pollen used. In this way, by the choice of a suitable pollen parent, valuable adaptations to the climate can be secured. By the use of two different kinds of pollen, one on the first half of the spathe to open and the other on the second half, the ripening season can be shortened from the normal eight weeks to about four weeks.

Contrary to the results observed from metaxenia in cotton, the effect of the pollen of any variety cannot be predicted, either on the time of ripening or the size of the seed.

508. ROSANOVA, M. A. 634.7-1.524

(New small fruits and their prospects in the U.S.S.R.)

Bull. Appl. Bot. Leningrad 1932 : Ser. A (1) : 79-92.

The possibilities are discussed of introducing into the U.S.S.R. various varieties and species of bush fruits, including certain wild species such as *Rubus moschus* Juz., which display distinct cultural possibilities, and other genera hitherto not cultivated, but which offer possibilities for improvement by selection and breeding.

509. DARROW, G. M. and WALDO, G. F. 634.711 Potomac

The Potomac raspberry.

Circ. U.S. Dept. Agric. 1933 : 259 : Pp. 4.

The Potomac originated from a cross of the Farmer black raspberry and the Newman red raspberry.

The description given shews it to be more vigorous and productive, better suited to canning and preserving, to have a longer ripening season and to be more resistant to fungous and virus diseases than black raspberries, to which it is most nearly comparable.

510. YARNELL, S. H. 634.75:576.356

Variation and chromosome behaviour in *Fragaria*.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 215-16. (Abst.)

Association between non-homologous chromosomes was found in triploid plants from the *vesca-bracteata* species group. The cytological behaviour of the triploid derivatives was examined for an explanation of the unexpected types of variation found in the progeny of triploid x diploid crosses. The results suggest that new combinations occur among the chromosomes of the two species and account for the chromosome behaviour. Much variation was found among the pollen. The substitution of part of the *bracteata* chromosomes by *vesca* chromosomes in diploids from the triploid-*vesca* cross may, it is suggested, account for the aberrant types found.

511. 634.771:576.16:575.252

HALL, C. J. J. VAN

634.771 Congo

De oorsprong van de "Congo-banaan." (The origin of the "Congo-banana.")

Ind. Mercuur 1932 : 55 : p. 245.

Amongst the bananas collected by G. H. Williams of the United Fruit Company was one obtained from Guadeloupe under the name "naine géante." For the sake of secrecy it was renamed Congo.

The author refers to an article by Kervegant in L'Agronomie Coloniale 1931, in which the bananas grown in Martinique are described. Amongst these the dwarf or Canary banana *Musa nana* or *M. Cavendishii*, known locally as "naine," appears. This banana is said to give rise with some frequency to a giant bud mutation, one of which is illustrated in the present article. This accounts for the local name "grande naine" and it is highly probable that the "naine géante" of Guadeloupe is the same banana. The so-called "Congo" is moreover said to be of good shipping quality and this with the fact that the dwarf banana in the Canaries has never been known to produce a giant bud variant suggests the possibility of the existence of two distinct dwarf forms.

512. COLLINS, J. L. 634.774:576.356.5

Morphological and cytological characteristics of triploid pineapples.

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : p. 30. (Abst.)

From a number of hybrids eleven plants have been produced with $3n$ (75) chromosomes, by the union of an unreduced egg with a normal male gamete. Tri-, di- and univalent chromosomes were observed at diakinesis and the viability of the pollen proved to be greater than that of the eggs in backcrosses. Economically valuable characters not found in the diploid pineapples are found in some of the triploids.

513. COLLINS, J. L. and HAGAN, H. R. 634.774-2.7-1.521.6
Nematode resistance of pineapples. Varietal resistance of pineapple roots to the nematode *Heterodera radiculicola* (Greef) Muller.
 J. Hered. 1932: 23: 459-65, 503-11.

The present investigation was carried out on young plants of eight pineapple varieties. Measurements of fibrous roots were made. Lot 520 was found to contain the largest percentage, and Cayenne the smallest percentage of fibrous roots. The length and number of roots appear to differ with the variety.

The proportion of gall-free roots was high in Lot 520 and low in Cayenne and Taboga.

The relation of the length of roots to the degree of infection was investigated.

No variety appeared to be immune. In a list of the varieties arranged according to their degree of resistance, Lot 520 is shewn to be the most resistant.

The results of these investigations are illustrated by one graph and several tables.

514. BRANAS, M. 634.83:576.312.35
 Recherches caryologiques sur la vigne. (**Karyological researches on vines.**)
 Ann. Éc. Agric. Montpellier 1932: 22: 5-12.

Ampelopsis cordata (Michx.), *A. aconitifolia* (Bunge.) and *Parthenocissus quinquefolia* (Planch) had 20n chromosomes.

All the other varieties of *Vitis* studied had 19n chromosomes except *V. rotundifolia* with 20n and *V. vinifera* var. Canon Hall Muscat with 38n.

515. STEINGRUBER, P. 634.835:575.42
 Die Grenzen des Erfolges bei Selektion im Weinbau. (**The limits of successful selection in viticulture.**)
 Gartenbauwissenschaften 1932: 7: 178-95.

While certain data are given from the author's station at Klosterneuburg near Vienna, the paper is largely a resumé of results achieved by workers on selection in the vineyard and of the opinions of certain workers on the question of senescence.

The author notes that although Bioletti had little success with selection in America, evidence of its value in other fruits at least is afforded by Shamel and Davis in that continent whilst in Europe there is ample evidence of the good effects of selection within a variety. Evidence is quoted from Klosterneuburg of the great improvement achieved at the research station by selecting Österreichisch Weisz and Rotgipfler vines. In the first beds from which selection was made the percentage figures of good and bad bearers were respectively 44 good to 56 bad and 46 good to 54 bad respectively. After selection from among the good bearers only, the percentages in the new beds were found to be 55 good to 45 bad and 64 good to 36 bad respectively. This indicates the practical value of selection but also raises the question as to why the result should not be even more striking. The author discusses the factors which appear to influence the success of selection:

Degeneration. Forcing a vine to give more than it has the capacity to give each year has bad effects. The variety Froelich-Sylvaner was subjected to too rigorous selection in the F_2 and F_3 generations which led to disastrous results. At Klosterneuburg other varieties which have not suffered such persistent selection have by judicious selection been greatly improved. Selectors in the author's opinion must beware of asking too much from a plant or of propagating from very old plants. He evidently supports the theory of senescence, for he quotes several instances cited by various authorities which seem to support it. On the other hand he notes the statement of Stummer and Frimmel that they have not yet succeeded in improving Portugieser blau by selection because it is a comparatively new variety and has not had time to differentiate sufficiently to offer suitable material for selection.

Locational and cultural factors. These may permanently or temporarily mark the high cropping capacity shewn by one clone. The soil may become vine sick.

Mutations. In vines the mutations which do occur normally persist, but selection may fail by reason of faulty budding or grafting or of incompatibility with rootstock.

516. **MOOG, H.** 634.835.09
 Beiträge zur Ampelographie II. (Notes on ampelography II.)
 Gartenbauwissenschaften 1932 : 6 : 561-611.

A continuation of the previous article (see "Plant Breeding Abstracts," Vol. II, Abst. 502), descriptions of thirty-six further American vines and hybrids being given. The classification according to the sex of the flowers has proved entirely satisfactory. Dimensions indicating the seed form are included in these descriptions in addition to the characters dealt with in the earlier communication.

A key for the determination of the hybrids is given.

517. **BUCHET and DEPARDON.** 634.835.094(44)
 Enquête sur les hybrides producteurs directs. (Inquiry into "hybrid direct producers.")
 Prog. Agric. Vitic. 1931 : 95 : 257-62.

The following vine varieties are described and recommended for cultivation in the Loir-et-Cher district : white Seibel hybrid 4986 is resistant to mildew, requires neither sulphur nor sulphate but is more sensitive to frost than the Seibel 4995 which shews no chlorosis in conditions of up to 25 per cent of lime.

Among the red hybrids Baco No. 1 displays great earliness, vigour and resistance to diseases and 50 per cent of lime. Seibel 4643 is resistant to mildew, to 10-15 per cent of lime and to drought. Seibel 5455 is resistant to mildew but not to lime.

518. **ZACHAREWICZ, E.** 634.835.094-2.181.1(44)
 Producteurs directs du champ d'expérience du domaine de Grange Rouge, de M. Paul Roche, à Roquemaure (Gard.). [The direct producers of the experimental fields of M. Paul Roche's estate "Grange Rouge" at Roquemaure (Gard).]
 Prog. Agric. Vitic. 1931 : 95 : 252-53.

The yields and the resistance to mildew of the black and white varieties of Seibel hybrids and of the black varieties of Cauderc hybrids which have been repeatedly flooded and differently treated with sulphate are briefly recorded.

519. **WELLINGTON, R.** 634.847.1.09:634.851
 The value of the European grape in breeding grapes for New York State.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 208-09. (Abst.)

Many of the varieties said to be pure *Vitis labrusca* have proved to be hybrids, some probably of *V. vinifera*.

The European grape is unsuited to N. American conditions chiefly through lack of hardiness. Crosses with *V. labrusca* have produced some F_1 hybrids of sufficient hardiness combined with the desirable qualities of *V. vinifera*.

520. **PEARSON, H. M.** 634.851:581.163
 Parthenocarp and seedlessness in *Vitis vinifera*.
 Science 1932 : 76 : p. 594.

The incapacity for fertilization of the ovules of two commercial varieties of seedless grapes, Sultanina and Black Corinth found by other workers has not been confirmed.

The author found normal fertilization in a large percentage of embryo-sacs of Sultanina. The characteristic degeneration occurred later in development. As a rule there were no normal embryo-sacs in Black Corinth at anthesis, but an occasional normal one was found.

521. **AUSTIN, L.** 634.975:575.12
 Pine and walnut breeding for timber production.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 2-4. (Abst.)

The Institute of Forest Genetics, into which the Eddy Tree Breeding Station has been converted, is concerned mainly with increasing the growth rate and quality of the trees.

Controlled pollination of pines has been effected and crosses made between hardy and drought-resistant *Pinus attenuata* on the one hand and the vigorous *P. radiata* on the other. Certain mutant pines have been produced by treatment with X-rays. Extensive examinations have been made of large numbers of trees with the object of selecting trees with increased vigour. Of particular interest are certain trees which displayed great vigour at high altitudes where the average tree thrives little.

Hybrid and other populations of walnuts have been examined from the same point of view.

522. AAMISEPP, J. 635(47.4)
Lühike ülevaade sordiarendus- ja katsetööst Jõgeva Sordikasvanduse kartuli, juur- ja kaunviljade osakonnas. (The activity of the truck crops and legume division of the Saatzucht- and Versuchsanstalt Jõgeva.)
Agronomoomia, Estonia 1932: 12: 361-65, 372.

The department possesses about 1,000 varieties of potatoes. The results of 8-10 years' experiments on the technique of cultivation will be published shortly. The varieties Kalev and Kungla proved the best.

Experiments on the cultivation of pea varieties are also in progress.

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523. LINDENBEIN, W. 635.13:576.312.35
Karyologische Studien an *Daucus Carota* L. (Karyological studies on *Daucus Carota* L.)
Ber. deuts. bot. Ges. 1932: 50: 399-406.

An investigation of meiosis in wild and cultivated strains of *D. Carota* clearly shewed that the haploid chromosome number is nine. Various configurations of the bivalents at diakinesis were observed, of which rings, closed and open were most frequent.

The bearing of these results on the probable relationship between the wild and cultivated varieties is briefly discussed.

524. FELIX, E. L. 635.25-2.4-1.521.6
Disease resistance in *Allium fistulosum* L.
Phytopathology 1933: 23: 109-10. (Abst.)

The onion variety Winterhecke, highly resistant to *Urocystis cepulae* Frost, has been identified as *Allium fistulosum* L. Its morphological characteristics are outlined.

525. PEARSON, O. H. 635.34:575
Breeding plants of the cabbage group.
Bull. Cal. Agric. Expt. Sta. 1932: 532: Pp. 22.

The floral biology of *Brassica oleracea* is first described and the phenomenon of compatibility briefly discussed. A detailed account is given of the technique of bud-pollination and methods for the isolation of the plants.

Two types of breeding programmes are then described. The first consists in alternate selfing and massing of the selected plants continued for several years; the second of continued inbreeding to secure pure lines and then testing selected plants for compatibility and crossing those that are self-incompatible. The seed of the superior hybrid progenies is then used commercially.

526. MAGRUDER, R. and MYERS, C. H. 635.34:575.061.6
The inheritance of some plant colours in *Brassica*.
Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 133-34. (Abst.)

From crosses and backcrosses between strains of *Brassica oleracea* var. *capitata* the following genetical formulae is given for the different types of colour that appear. SM = purple, Sm = sun colour, sM = magenta, sm = green.

527. NICOLAISEN, N. *Die wichtigsten Spinatsorten. Ergebnis eines Versuches zur Feststellung von Standardtypen, sowie deren Eigenschaften und Merkmalen für eine Anzahl im Handel befindlicher Spinatsorten. (The most important spinach varieties. Results of an experiment to establish the standard types for a number of commercial spinach varieties.)* Züchter 1933 : 5 : 1-8.

Twenty-eight varieties of various origins were sown, each in five repetitions and from these a number of standard types chosen. The colour, weight, water content and leaf form of these types are described and illustrated.

528. LESAGE, P. *Sur l'acquisition progressive de la précocité dans le *Lepidium sativum*. (Progressive acquisition of earliness in *Lepidium sativum*.)* C.R. Acad. Sci. Paris 1932 : 195 : 719-21.

The earliness acquired by growth in frames or in the south was transmitted to a number of consecutive generations grown at various stations in the open air, the effect increasing with the number of generations under treatment. The conclusions are illustrated by graphs.

529. STCHENKOVA, M. *[Geographical variation and centres of origin of the garden cress (*Lepidium sativum* L.).]* Bull. Appl. Bot. Leningrad 1932 : Ser. 9 (1) : 183-253.

The investigations were carried out on specimens numbering about 300, collected by expeditions in the various countries in which the species grows. The present area of the species covers northern Africa, south-western Asia and Europe. It displays a wide degree of variation, but most of the variants are not strictly geographically localized; the species is "still in the stage of forming climatypes." A chart is given indicating the occurrence of the different variants in the various countries and the characters are discussed in turn, with illustrations of the main types. The main character on which the subdivision into botanical groups and variants was based was leaf form, especially as observed in the lower leaves of the plant. Two main geographical groups could be established morphologically; the first is characteristic of and mostly endemic to Abyssinia and Eritrea, its chief features being a greater degree of variation and predominance of dominant characters. Many characters are observed in this group which are absent in all other members of the species—e.g. yellow stamens, three-valved siliques, greyish-green seeds. Of the endemic varieties described, one is a dwarf form confined to certain high altitudes, another a weed form symbiotic with flax. In all, four varieties, with their subvarieties, are described in this group.

The second group is the Asiatic-European group, characterized by recessive characters, such as entire or less divided leaves, brownish-yellow or pinkish-grey seeds, and a much lower degree of variation and of geographical specificity. The most sharply defined sections of this group are those of Afghanistan and Asia Minor. The former display a group of xerophytic characters contrasting with the hydrophytic characters of the latter, but these differences are not always hereditary. Eight varieties of this group are described. All twelve varieties are furnished also with latin diagnoses.

The article terminates with a key for the determination of the varieties.

The Abyssinian group in all its characters, including a tendency to freer dispersion of the seeds, shews indications of being an ancient group, already differentiated into clear climatypical units and this small enclosed region is regarded therefore as the centre of development and dispersion of the species. Europe and the nearer East are regarded as a secondary centre of development. Evolution is regarded as having occurred in two directions, firstly in Abyssinia towards a more pronounced division of the leaf lamina (dominant character), which then on passing away from the centre has become gradually reduced and replaced by the recessive entire type. The curly types are of recent origin and characteristic of cultivated forms.

The weed form associated with flax and imitating it in various features shews the greatest resemblance to the cultivated type and it is thought probable that this weed form has entered into cultivation and given rise to the common cultivated forms.

530. SINNOTT, E. W. 635.62:575-181

The genetic basis of dimensional traits in *Cucurbita* fruits.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 184-85. (Abst.)

Crosses between strains of *Cucurbita pepo* with disk-shaped and spherical fruit shewed that shape is dependent on a single factor, but that multiple factors determine fruit size. Evidence is then presented for the hypothesis that fruit dimensions have themselves no genetical basis, but are the result of interaction between the factors for size and shape.

531. 635.62:575.127.2:575.11.061.1

WHITAKER, T. W. 635.62:575.127.2:575.11.061.6

Fertile gourd-pumpkin hybrids. The inheritance of factors for shape and colour in summer squash-gourd-pumpkin crosses of *Cucurbita pepo*.

J. Hered. 1932: 23: 427-30.

Varieties of the common summer squash and pumpkin types of *C. pepo* and yellow-flowered gourds *C. pepo* var. *ovifera*, were crossed and found to be interfertile.

In a cross between a gourd with pear-shaped fruits and a summer squash with scalloped fruits, pear-shape behaved as a simple recessive to scallop.

C. pepo var. *ovifera* with solid white body colour was crossed with a field pumpkin *C. pepo* var. Mammoth Tours with solid green body colour and the results indicated a one factor inheritance with white dominant.

532. RUTTLE, M. L. 635.62:576.312.35

Chromosome number in the genus *Cucurbita*.

Tech. Bull. N.Y. Agric. Expt. Sta. 1931: 186: Pp. 12.

The chromosome numbers of varieties of *Cucurbita Pepo*, *C. moschata* and *C. maxima* were found to be 40 2n with a doubtful 40-44 2n in Large Cheese, a variety of *C. moschata*.

533. CURRENCE, T. M. 635.64:575.116.1

Genetic association between qualitative and quantitative characters in the tomato.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 32-34. (Abst.)

Analyses of the data from crosses between plants with determinate and indeterminate growth habit indicate that determinate growth habit behaves as a simple recessive character. It is carried in the fourth chromosome and is linked with the character of potato leaf, giving a crossing-over percentage of 2-4.

The relation of time of fruit ripening to the genes in the six different chromosomes was also studied from the same material and it is assumed that the factor or factors for earliness are associated with the first, third, fourth and sixth chromosomes, possibly with the second and fifth as well.

There were indications of an association between fruit size and the fifth chromosome pair. Fruit contour appears to affect fruit size.

534. LINDSTROM, E. W. 635.64:575.116.12:576.356.5

Genetic evidence for attraction of dissimilar chromosomes in tetraploid species hybrids of tomatoes.

Amer. Nat. 1933: 67: p. 67. (Abst.)

Tetraploid hybrids of two species were produced by the decapitation method. In the F_2 and F_3 progenies of this tetraploid F_1 the numbers of recessives are such as to prove that pairing has occurred between unlike chromosomes. Like genic constitution is thus not the only factor which influences pairing.

535. MACARTHUR, J. W. 635.64:575.116.4

Linkage groups in the tomato.

Amer. Nat. 1933: 67: p. 82. (Abst.)

So far fifteen genes had been placed in seven linkage groups. Three new genes studied—purple stem turning green (a_2), wilted leaf (wt) and dwarf accentuator (d_2) proved independent of these groups and of one another, making ten groups in all.

536. SCHIEMANN, E. 635.64:575.242:581.45
 Zur Genetik einer fadenblättrigen Tomatenmutante. (*Genetics of a mutation of tomato with thread-like leaves.*)
 Z. indukt. Abstamm.- u. VererbLehre. 1932 : 63 : 43-93.

A mutant of *Solanum lycopersicum* which appeared to be a recessive homozygote of the variety Komet was investigated. It differs from the original by its thread-like leaves, dwarf size, choripetal flowers. Its reduced fertility and increased flowering capacity is purely phenotypic and not due to a change of genotype. The chromosome number remains $n = 12$.

Crosses with three different varieties and backcrosses shew the form of the leaves to be due to five factors.

Morphologically similar mutations have been obtained with other varieties and even other species and families.

537. LINDSTROM, E. W. and HUMPHREY, L. M. 635.64:576.356.5
 Comparative cytogenetic studies of tetraploid tomatoes from different origins.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 118-19. (Abst.)

Five tetraploid tomatoes produced from the callus, two from *Lycopersicum esculentum*, two from *L. pimpinellifolium* and one from a hybrid between the two species, are described.

In general all are more or less self-fertile, but completely cross-sterile with other diploids. There is about 20 per cent of abortive pollen. Fruit size is about the same as that of the diploid except where decreased seed formation leads to a reduction in fruit size. The selfing of heterozygous tetraploid forms gives a segregation that indicates random association of the four chromosomes.

Cytological investigation shews a high degree of regularity but some lagging of the chromosomes which may account for the pollen sterility.

538. MORRISON, G. 635.64:576.356.52
 The occurrence and use of haploid plants in the tomato with especial reference to the variety Marglobe.
 Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : 137-39. (Abst.)

Six haploid plants were found among the varieties, Marglobe, Gulf State Market and Earliana. From two of the three haploid Marglobe plants, two and four fruits respectively were produced by open pollination, from these ten and twenty-six plants were reared which resemble the normal Marglobe variety, but proved to be heavier yielders and thus from the original haploid plants superior pure lines have been raised.

539. MACARTHUR, J. W. 635.64:581.46:575.11:575.116.1
 Inherited characters in the tomato. I. The self-pruning habit.
 J. Hered. 1932 : 23 : 395-96.

In self-pruning plants the fruiting branches occur in nearly every internode and their terminal growth ceases when fruits set.

Crosses between self-pruning and normal plants gave a normal F_1 and segregation in F_2 is monofactorial.

A study of the linkage relations shews that Sp_{sp} (or Tt) the self-pruning gene is situated in the IV linkage group which contains also Cc the gene controlling cut-leaf and potato-leaf.

540. SENGBUSCH, R. v. and LOSCHAKOWA-HASENBUSCH, N. 635.64-2.484-1.521.6:575.11
 Immunitätszüchtung bei Tomaten. Vorläufige Mitteilung über die Züchtung gegen die Braunfleckenkrankheit (*Cladosporium fulvum* Cooke) resistenter Sorten. [Breeding for immunity in tomatoes. Preliminary report on breeding varieties resistant to leaf mould (*Cladosporium fulvum* Cooke).]
 Züchter 1932 : 4 : 257-64.

Cladosporium fulvum Cooke is the pathogene of leaf mould, one of the most wide-spread diseases of greenhouse tomatoes. All the methods attempted up till now to prevent this disease appear

to be insufficient; the only possible protection against it consists in breeding immune varieties. The authors tested forty-one varieties of cultivated tomatoes for their immunity to *C. fulvum* by artificially infecting the plants or the seedlings. Stirling Castle was found to be resistant, but not immune. Only *Solanum racemigerum*, a wild form closely related to *S. lycopersicum*, was immune.

Crosses were then made between *S. racemigerum* and susceptible cultivated tomatoes. All the F_1 's were immune; in the F_2 's and F_3 's the results obtained shew the immunity to be due to a single dominant factor. These crosses with *S. racemigerum*, which possesses the undesirable feature of small fruits, indicate the possibility of obtaining immune forms with large fruits.

In crosses between Stirling Castle and susceptible varieties all the F_1 's were highly susceptible. Thus the resistance of Stirling Castle, contrary to the immunity of *S. racemigerum*, appears to be due to recessive factors.

The investigation of the question whether *C. fulvum* has biotypes or forms differing in their pathogenicity from the present form will be of great interest.

541. GLOYER, W. O. 635.65:581.48:575.25
Somatic segregation of an environmental character (hardshell) in pure lines of beans.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: 63-65. (Abst.)

The hardshell condition, in which the seeds fail to swell after 24 hours in water at room temperature, is quite frequent in beans and can be overcome by altering the conditions of temperature and humidity. All degrees of hardness may be found in a seed population and the character is regarded as somatic and environmental.

The environment, such as wet soil which decreases the germination of the permeable seeds, acts as a selective agent.

Investigation shewed that there was no uniformity with regard to the hardshell condition within a plant.

Individual plant selection is found to be a quicker means of eliminating the hardshell type than mass selection.

542. SVESHNIKOVA, I. 635.651:575.127.2:573.3
A study of interspecific hybrids of *Vicia*.

Proc. 6th Int. Cong. Genet. N.Y. 1932: 2: p. 195. (Abst.)

A cytological study of species of *Vicia conspescis sativa* in relation to their taxonomy has shewn the importance of translocation in the formation of new species.

543. SENJANINOVA-KORCZAGINA, M. 635.651:576.312.32:576.16
(Karyological investigation of the question as to the origin of *Vicia Faba*.

Bull. Appl. Bot. Leningrad 1932: Ser. 11 (1): 91-118.

A study of the chromosome morphology by Levitsky's method (see "Plant Breeding Abstracts," Vol. II, Abst. Nos. 564 and 565) enabled the authoress to distinguish different types within the species *V. narbonensis*.

The extraordinary morphological similarity of *V. narbonensis*, *V. serratifolia* and *V. Faba* is pointed out by descriptions and tables. The karyotypical differences between them are clearer than the morphological. The present authoress, however, has detected the presence in both the other species of a type of three-limbed chromosome characteristic of *V. Faba*.

The ratio between the length of the limbs of all seven chromosomes was observed in specimens of *V. narbonensis* from different places. The sample from Transjordanian proved to be clearly distinct from those from other parts of Europe except in the three-limbed chromosome, one of the differences being a greater inequality in the length of the limbs. This is not the only difference however, and the impossibility to homologize the chromosomes leads to the conclusion that the Transjordanian type has originated independently. If evolution has occurred by shortening of the chromosomes, it is pointed out that this must have occurred at different rates in different chromosomes. One of the most advanced types in the direction of unequal chromosome limbs, however, was characterized by an extremely primitive leaf type.

On examining the chromosomes of *V. serratifolia* on similar lines it was seen that all chromosomes except the three-limbed one were distinct from those of the common *V. narbonensis* and much more closely resembled those of the Transjordanian form of this species, which represents a type intermediate between the two.

In addition to having one more chromosome than the other two species, *V. Faba* is distinct in the three-limbed chromosome, which is longer and different in the relationships of its parts. An independent evolution from a common ancestral form is thus also assumed for *V. Faba*. This evolution in addition to the development of the three-limbed type, has involved a shortening of one limb of the chromosome.

The two races *major* and *minor* of *V. Faba* could in no way be distinguished by their karyotypes.

544. BÜNNING, E. 635.652:581.143.26:575
Ueber die Erbllichkeit der Tagesperiodizität bei den *Phaseolus*-Blättern. (On the inheritance of daily periodicity in *Phaseolus* leaves.)
Jb. wiss. Bot. 1932 : 77 : 283-320.

Not only are the daily movements of *Phaseolus* leaves proved to be autonomous but experiments are devised to shew their hereditary nature.

The pods of plants grown in the open were subjected to variations in length of day by being enclosed for longer or shorter periods in bags of black paper. No variation from the normal periodicity of the movements subsequently occurred in the plants grown from these treated seeds. Seeds from pods harvested at different periods from August—October also shewed no variation. The effect of changes of temperature was only to increase or diminish the duration of the oscillations.

Semon's view that the movements represent an acquired character is discussed and not accepted. The data are taken as shewing the movements to be due to the inherent nature of the plant.

545. TSCHERMAK, E. 635.652:581.466:575.242
Petaloid-Ausbildung des Kelches bei *Phaseolus multiflorus*. (The petaloid development of the calyx in *Phaseolus multiflorus*.)
Anz. Akad. Wiss. Wien 1931 : 68 : Nr. 25.

The development of several petaloid sepals, of increased size and differing in colour and shape, was observed in three individuals of the crosses *Phaseolus vulgaris* x *P. multiflorus*. As these hybrids are fertile on selfing, it will be possible to shew whether the new character is due to a mutation or only to a modification.

Thus the occurrence of calycanthem, which thus far has been observed only in the Sympetaleae, has been demonstrated in the Papilionaceae.

546. SCHREIBER, F. 635.652-2.483-1.521.6:575
Vererbungsstudien an Anthraknoseresistenten Bohnen. (Inheritance studies on beans resistant to anthracnose.)
Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : p. 178. (Abst.)

"The author has developed an anthracnose-resistant canning bean of high market value. An analysis of the genetical behaviour of resistance, of seed colours, and of certain other characters is given. Further, an induced mutation is described."

547. WOODWORTH, C. M. 635.655:575.11
Genetics of the soybean.
J. Amer. Soc. Agron. 1933 : 25 : 36-51.

A comparatively small amount of work has been done thus far on the genetics of the soybean, and the characters whose inheritance has been studied are mostly qualitative, such as seed colour or flower colour, which are of little value for the practical breeding of the crop. However a list of genes and a chromosome map is given by the author in illustration of the progress made in the genetics of the soybean.

Data are presented on the inheritance of three new qualitative characters. Bloom on the seed coat is considered to be due to three complementary genes B_1 , B_2 and B_3 . Variegated leaf (v_1) and determinate pod-bearing habit (dt) appear to be simple recessives.

A number of crosses between soybean varieties were made in order to study the inheritance of characters having a bearing on the physiology and productivity of the plant. The softness of seed coat shews evidence in the F_2 of transgressive segregation. A relation to seed colour is indicated.

Hybrid vigour was observed in three crosses. In two of them one variety was the parent of both and one of these two crosses displayed more heterosis than the other.

An attempt is made to study the five components of the seed yield of different varieties. As a result of these studies a variety is regarded as a biotype with its own special yield components; two varieties may have identical yields but arrived at in entirely different ways.

Genetic correlations are calculated between the different yield components and between these and the yield itself; in general they appear to be not significant.

548. . . . BOURDOUIL, C. . . . 635.656:575.12:581.48

Relation, chez les hybrides de *Pisum*, entre la synthèse de l'amidon et le poids des graines. (**Relation, in *Pisum* hybrids, between the synthesis of starch and the weight of the seeds.**)

C.R. Acad. Sci. Paris 1932: 195: 1317-19.

The F_2 generation, consisting of 4,251 seeds of the cross green wrinkled x yellow round (see "Plant Breeding Abstracts," Vol. II, Abst. 723) shewed independent assortment of the two characters. The weight and starch of all the wrinkled peas were less, as in the wrinkled parent; this is ascribed to a premature cessation in starch formation in this type, which also brings about the wrinkling.

549. . . . 635.656:581.162.5:575.11

635.656:575.114:575.2

NILSSON, E. . . . 635.656:581.45:575.11.061.5
Erblichkeitsversuche mit *Pisum*, VI—VIII. (**Inheritance experiments with *Pisum*, VI—VIII.**)

VI. Neue Fälle von Semisterilität. (**New cases of semi-sterility.**)

VII. Spaltung in Verschiedener Variationsweise. (**Segregation according to different modes of variation.**)

VIII. Ein Lokalisationsgen für Wachs und sein Verhalten zu den Genen Wa und Wb. (**A localization gene for waxy and its behaviour with the genes Wa and Wb.**)

Hereditas 1933: 17: 197-222.

Semi-sterile plants were found among the progeny of the cross Bohnenerbse x Automobil in about a 1:1 ratio. There was no linkage between semi-sterility and the genes Pl and Bt.

Semi-sterile plants occurred spontaneously among some plants of the variety Sabre. They have remained constant for three generations.

Another semi-sterile plant occurred in a strain of which the name has been lost. There were too many semi-sterile plants for a simple 1:1 ratio and a more complex inheritance must be involved. There appeared to be no connection between the semi-sterility and the segregation of the allelomorphs Aa.

In crosses between Extra Rapid and the varieties American Wonder, Witham Wonder and Lincoln the ratio of semi-sterile to normal plants was 1:1. The possibility of linkage between semi-sterility and the genes Le, Btb and R was studied. Linkage was only found between the genes Btb and R in the cross Witham Wonder x Extra Rapid.

Four semi-sterile plants were found in the F_1 of a mutant from English Wonder x de Grace. Segregation ratios for these plants are not available.

This work is only of a preliminary nature and further investigations are in progress but it is of importance as indicating the prevalence of semi-sterility in *Pisum*.

In the F_4 crosses between "Dippes maj" and "Dicksons früheste und beste" plants were observed with three—six leaflets to a leaf. Investigation shewed that there was no constant segregation of this character which was much influenced by external conditions, but that the families segregated according to the amount of variation.

A plant was observed lacking the normal waxy covering in the upper surface of the leaflets. This character behaved as a simple recessive to the normal waxy condition, Wlo. There was no linkage between the genes Wlo, Wa and Wb.

550. WHITE, O. E. *Genetic interrelationships of some foliage, pod and cotyledon factors in *Pisum*.* 635.656:581.4:575.11

Proc. 6th Int. Cong. Genet. N.Y. 1932 : 2 : p. 209. (Abst.)

The foliage colours, gold, lemon and normal green all give monohybrid ratios in F_2 and behave as a triple allelomorphic series. These three factors also determine pod colour and there is also a fourth, independent factor, Canary, that behaves as a simple recessive. There are three cotyledon colours, two yellows, one dominant and one green. Either yellow crossed with green gives a 3 : 1 ratio.

Yellow 1 x yellow 2 gives a dihybrid ratio of 13 yellow to 3 green. There is a linkage with 12.1 per cent repulsion, and 10.1 per cent coupling, between yellow 1 (dominant) and the foliage colour factors. Unexpected ratios were obtained when the shape factors were involved, which were not due to linkage nor to lethal factors.

BOOK REVIEWS.

- BERTALANFFY, L. V. *Theoretische Biologie. Band I. Allgemeine Theorie, Physikochemie, Aufbau und Entwicklung des Organismus. (Theoretical biology. Vol. I. General theory, physical chemistry, structure and development of the organism.)* 57
Gebrüder Borntraeger, Berlin, 1932 : Unbound RM. 18, bound RM. 20.
Pp. xii + 349. 4 illus.

An attempt is here made to present the problems of modern biology from a uniform standpoint and to introduce a certain amount of clarity into the general ideas and principles involved, in the attempt to discover some common uniform system. Just as in physics the theoretical aspect is stressed equally with the practical, it is time that in biology the amassing of new facts be accompanied by attempts to co-ordinate and interpret those which we already possess. In doing this a very large number of modern works of the most varied nature in different biological fields is reviewed. Works appearing up to the beginning of 1932 have been included. Chapters are devoted to general biological and biochemical conceptions. The fourth deals with cytology in its broadest aspect. The chapters are furnished with short historical introductions, in which the outstanding general works on the subject are indicated, and selected bibliographies.

- LINDSEY, A. W. *A textbook of genetics.* 575.1
The MacMillan Co., N.Y. 1932 : 14s. Pp. xvi + 354 : 128 illus.

Claiming as it does to be an elementary treatise on genetics, the present book nevertheless treats the subject from a very broad aspect. The development of the subject prior to Mendelism is traced, the enormous practical importance of genetics, especially in agriculture, is emphasized, and the general phenomena of reproduction are described. After a brief discussion of variation and the methods of study in heredity, the Mendelian Laws are expounded clearly and concisely, followed by the early evidence for the chromosome mechanism of inheritance and on the nature and inheritance of sex. The position arising from the more recent observations on chromosome behaviour is discussed in a special chapter on the chromosome complex and further in connexion with interspecific hybridization. Many of the statements in the latter section have, however, ceased to apply rigidly since the production of balanced true-breeding hybrids.

The application of genetics in plant breeding is also afforded a special chapter ; here again the treatment is made with a view to the past rather than the future.

The remaining chapters are devoted to animal and eugenic problems.

Each chapter is furnished with a list of problems and a selected bibliography and the whole volume with an admirable index and adequate illustrations.

- SINNOTT, E. W. and DUNN, L. C. 575.1
Principles of genetics. A textbook, with problems.
 McGraw-Hill Publishing Co., Ltd., London, 1932: 21s. Pp. xvi + 441.
 197 illus.

This, the second edition of this well-known book has incorporated much of the new material which has been added to the science since the first edition appeared in 1925.

It is interesting to note that the vast majority of these additions are centred round the new developments in cytology in its bearing on genetic phenomena; a new chapter on evolution has been added, very largely based on recent discoveries of chromosome behaviour, which have shed light on many of the problems of the early evolutionists. The section on biometry has also been suitably revised.

The exposition of the general principles has remained substantially the same, although some of these have been illustrated by more recent and interesting examples. Some important questions, such as the inheritance of quantitative characters, still receive somewhat cursory treatment and we suspect that certain phenomena, such as heterosis, are not quite so straightforward as the authors' explanation suggests.

Each chapter is as before furnished with a set of carefully devised and stimulating problems together with an appropriate bibliography.

- FÖYN, B. 575.116.7
 575.18
Geschlechtsgebundene und geschlechtskontrollierte Vererbung. (Sex-linked and sex-controlled inheritance.)

Handb. Vererbungswissenschaft 1932: 1: Lief. 17 (I, 1) Pp. 122.

The sex may influence the inheritance of characters in two ways—the characters may be inherited together with sex, in the same chromosomes, or the genes may be evenly distributed between the two sexes but their phenotypic expression be different in the male and female. The first part of the book is devoted to a full exposition of the first of these two phenomena with ample illustrations and of the various deviations which result from particular chromosome irregularities. This material is mostly from the animal kingdom. There follows a section in which other material illustrating the same phenomena is quoted, including various cases in plants.

The remainder of the volume deals with the second type, sex-controlled inheritance. Again the material is mostly animal but *Melandrium* serves to illustrate similar phenomena in the plant kingdom.

The volume terminates with a full bibliography.

- FAULKNER, O. T. and MACKIE, J. R. 631(66)
West African agriculture.

Cambridge University Press, London, 1933: 8s. 6d. Pp. vi + 168.

An account is given in some detail of the agricultural practices of Nigeria, which are taken as typical for a belt of country including the north of the Gold Coast. An invaluable introduction for anyone taking up breeding or other work in these regions and in general for those unfamiliar with tropical conditions.

In the second part the cultivation and utilization of the main crops is described; the improvements brought about by the planting of improved types of oil palm, cotton, groundnuts, together with a brief indication of the lines on which attempts are being made to bring about this improvement in type, are given brief mention.

We were not aware that the coconut has been rechristened *Cocos micifera*!

- MORSTATT, H. 632.9:016
Bibliographie der Pflanzenschutz-Literatur. Das Jahr 1931. (Bibliography of the literature on plant protection for the year 1931.)

P. Parey and J. Springer, Berlin, 1932: 8vo. Pp. iv + 251.

The first 9 pages deal with general textbooks and reports on agricultural activities from all parts of the world. Pages 10-47 deal with books and papers on plant diseases and their causes.

The main part of the book is concerned with infected crop plants and the last 33 pages with measures for preventing diseases.

An alphabetic author index is appended. An excellent reference book for those workers who are interested in the pathological side.

LEHMANN, E. and AICHELE, F. 633.1/2:581
Keimungsphysiologie der Gräser (Gramineen). [**Physiology of germination of the grasses (Gramineae).**]
Ferdinand Enke, Stuttgart, 1931: Unbound RM. 54, Bound RM. 56.70,
Pp. xxiii + 678. 152 illus.

The subject of germination has in recent years received an extensive investigation and a remarkably exhaustive survey of one section of these investigations, those relating to graminaceous seeds, is presented in the monograph under review.

The object of the work is to describe the development of the grass seed from the flower and its return to the growing, active state; the processes involved are regarded from the morphological, physiological and physical points of view. The ripe fruits of the different families and their chief representatives are described in turn, after which the chemical composition of the fruits is treated similarly. The water absorption phenomena are discussed in some detail, followed by a special section on the germination processes proper and the influence of the most various reagents and factors thereon, in general and on the individual representatives in turn.

The book is furnished with a remarkably full bibliography itself covering over 70 pages.

RATHLEF, H. v. 633.491:575.19
Die Stammtafeln des Weltsortiments der Kartoffel und ihre generativ fruchtbaren Sorten. (**The genealogical tables of the world potatoes and the varieties which produce fertile flowers.**)
Kühn-Archiv 1932: 33: 297-431. Also separately, price 1 $\frac{1}{2}$.

The author has collected all the possible information obtainable from the published writings and from correspondence with the breeders, the object being to present an accurate account of the relationships existing between the varieties at the disposal of the breeder and their respective pedigrees. The work has been carried out for the first time on a world scale, making available a vast field of information which previously has been quite beyond the reach of the breeder.

A point of primary importance before beginning breeding or genetic work is fertility. A notable feature is the table giving the pollen quality and degree of reliability as male and female parent, together with wart reaction and yield, of all the chief varieties.

The material is tabulated in such a way that for each variety the descendants which it has produced, together with their parentage, can be found. The relative value of the varieties as parents can in this way be judged. Special attention has been given to the question of wart resistance and wherever possible the reaction of the variety in question is indicated.

The author expresses the opinion that the great majority of the pedigrees published by the breeders of the varieties in question are correct and takes them as being so. The pedigree of no variety can be traced beyond 8 or 9 generations and it is interesting to note that only 4 of the 10 biggest groups are traceable to land races. Another interesting point that arises is that from as early as 1850 there are records of seedling production in the U.S.A.

The existing varieties are arranged in 7 groups according to their parentage. The parental varieties are taken in turn and a table given of the varieties they have produced in the F_1 , F_2 , etc., etc., generations, with their parentage. From these tables therefore the genealogical table for any given variety can be determined.

The value of the work is very much increased by an admirable index and a remarkably complete and up-to-date bibliography, although the latter is not free from inaccuracies. Both the author and the Notgemeinschaft der Deutschen Wissenschaft are to be congratulated on the production of a milestone in potato breeding and genetics.

SPRECHER V. BERNEGG, A.

633/4

Tropische und subtropische Weltwirtschaftspflanzen. (Tropical and sub-tropical economic plants of the world.)

Ferdinand Enke, Stuttgart, 1929.

I. Stärke- und Zuckerpflanzen. (I. Starch and sugar plants.)

Unbound RM. 32, bound RM. 35. Pp. xv + 438. 133 illus.

II. Öelpflanzen. (II. Oil plants.)

Unbound RM. 25, bound RM. 28. Pp. xv + 339. 85 illus.

The author of these two volumes has spent some time in the Netherlands E.I., where he was engaged as breeder with a number of the most important tropical cultures. He is, therefore, personally familiar with a large proportion of the plants which he describes and moreover is alive to the particular aspects which interest the breeder.

The most important plants are treated in some detail, in addition to general questions of cultivation the history of the plants and their cultivation is discussed. In this connexion interesting philological evidence is included, together with quotations from the classics. The systematic position and relationships, and the morphology and biology of the plant are made the subject of special sections, followed by sections on breeding, in which useful features are the indication of the chief research institutes in which breeding is undertaken, of the principal varieties in existence, the objects of breeding and the correlation coefficients which have been established between different characters. The methods of breeding are also outlined.

Full treatment of this kind is afforded to rice, maize, sorghums and millets, sugar cane, olive, groundnut, soya bean, coconut palm, and oil palm.

Other plants are treated somewhat more briefly but on similar lines, namely manihot, sweet potato, yam, *Colocasia antiquorum*, various arrowroots, canna, *Sechium edule*, sago, sugar palm, *Cyperus esculentus*, sesamum.

A work of this sort cannot be expected to be up to date; the present work is no exception. Owing to the rapid advance of the science the breeding sections suffer particularly much in this respect. The extreme value of the work as a reference book, however, remains unimpaired and the attractive presentation and style make it more than this; a book full, in fact, of interesting and often out-of-the-way information which the reader will not lay down without regret.

HUNTER, H. and LEAKE, H. M.

633/4:575

Recent advances in agricultural plant breeding.

J. and A. Churchill, London, 1933: 15s. Pp. x + 361. 16 illus.

The object of the volume is "to portray some of the advances that have been made in improving crop plants, more especially those that have been made with the specific object of meeting obvious agricultural needs." A truly imposing series of achievements on the part of the practical geneticist is passed in review. In doing this the authors have rendered an inestimable service to breeders of all descriptions; since Fruwirth's manual no attempt has been made to bring these results together and present them in a form in which they make a readable outline of the subject and at the same time a source of reference to what has been accomplished up to date in the various fields. Breeders have for the first time such a work at their disposal in English and have now an opportunity of surveying the advances that have been made in recent years in crops other than those with which they are primarily concerned. Breeders in the tropics will probably receive guidance for solving their own problems from the solution of similar problems in the temperate zones. Breeders in the temperate zones will on the other hand probably be astonished by the magnitude and the interest of the work accomplished on many tropical crops.

The introduction serves to illustrate how plant improvement is a purely relative thing, depending on innumerable factors of demand and inextricably interlinked with the improvement of cultural and soil conditions.

In the chapters devoted to individual crops which follow, a feature of interest is the treatment of each from a historical point of view, describing the economic conditions and considerations which influenced the lines taken by early breeding and giving the origin, and pedigrees where known, of the varieties which have played the greatest role in the improvement of each crop. Valuable indications of breeding procedure are also given.

A notable feature of the book, and one in which it differs from so many works of a similar kind, is the ample consideration given to important work done abroad and published in foreign languages.

No one reading this book can fail to be struck by the difference in stage of development of breeding work in the temperate cereals for instance, which formed the first object of the plant breeder, and the tropical crops such as rubber, tea, oil palm and the like. This is inherent in the nature of the 2 groups of crops and the circumstances of their cultivation. The tropical breeder will be probably convinced that a great deal of groundwork has yet to be accomplished before his crops reach the high-bred state characteristic of the annual crops of the temperate regions. This justifies the inclusion of a number of general topics such as classification, floral morphology, etc., in the sections on most of the tropical plants. Reference to the rather vast amount of theoretical work which has been done in such plants as tobacco and maize has been wisely omitted. It is inevitable that a work of this nature should rapidly become out of date and several of the statements made have now been modified by later work. Some crops, notably sugar beet, are not included. These errors of omission, however, are amply counterbalanced by the advantage of reference to several unpublished investigations; in the groundnut, for example, perhaps the most important genetical studies are written in an unpublished thesis and in this book for the first time made available to the general reader. It is earnestly to be hoped that the omissions will be removed by publishing revised editions of the work from time to time.

One more criticism will occur to the careful reader: it is unfortunate that in a work of this excellence so many orthographical, grammatical and typographical errors should have been allowed to remain.

GISTL, R. and NOSTRITZ, A. F. v. 633/5(43 + 43.6 + 49.4)
 Handelpflanzen Deutschlands, Oesterreichs und der Schweiz. (The economic
 plants of Germany, Austria and Switzerland.)
 Ferdinand Enke, Stuttgart, 1932: Unbound RM. 17, Bound RM. 18.80.
 Pp. viii + 284. 40 illus.

Both wild and cultivated plants, food and technically used plants as well as the commonest medicinal plants are dealt with in this monograph. Brief descriptions are given of the individual plants, arranged according to botanical groups. Indications are given of the origin, history, botanical characteristics and application of the plants, together with brief remarks on their cultivation and illustrations of a large number.

A valuable reference book for breeders and others engaged with crop plants of the temperate regions.

A NEW JOURNAL

All those who attempt to keep abreast of the ever-increasing tide of literature in such a comparatively restricted field as plant genetics realize how impossible this has now become for those who are carrying out their own original researches. To do this for the whole field of botany is now no longer dreamt of and one of the solutions to this difficulty is the publication of a New Journal! The *Fortschritte der Botanik* contains articles in which the progress of the past year in the various fields is reviewed by thoroughly competent experts in the respective fields. Breeders will welcome this opportunity of keeping up-to-date in the more general branches of botanical research.

The first volume covers the work effected in 1931 and it is the intention of the publisher to issue future volumes covering the same field at annual intervals. The material is divided into the following main headings: morphology, systematics and genealogy, physiology of metabolism and of development, and ecology. The second of these sections contains a chapter on systematics and plant geography.

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